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WITNESS my hand this
Fourteenth day of July 2004

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Field of the Invention

This invention relates to locks for displaceable wings, said wings including French Doors, Security Doors and Timber Doors and includes hinged and sliding doors.

Background to the Inventions

French doors, as defined below, typically employ a lock having a lock body that is morticed into the frame on the closing edge wing and handle assemblies that are mounted on each side of the wing adjacent the lock body to be connected to the lock body by a shaft. Now days, these doors are often closed against a strip of compressible sealing material located between the door and an element defining in-part the opening and against which the wing closes (this strip being to prevent energy loss) - this action sometimes requiring a not insignificant force.

These doors can be urged fully closed by the inclusion of a lock that has remote plunger-like members that are driven into receiving apertures of upper and lower elements of the opening and/or the inclusion of a lock having a suitably shaped bolt (described below) that is urged outwardly by the operating levers (as described below)

Typically locks for common French Doors must have a lock body of small depth and not more than about 40MM, a small setback not exceeding about 30MM, a small width not exceeding about 16 MM, a bolt that can extend at least 15 MM from the lock body and preferably means to displace rods at least 15 MM. Preferably, an industry standard for the distance between the cylinder and lever axii of 85.00 MM should also be observed.

Typically locks for common Security Doors require the lock to have a smaller lock body having depth not exceeding about 40MM, a setback of about 27MM, a width of about 14.5 MM, a bolt that can extend at least 14 MM from the lock body and preferably means to drive rods or cables at least 11 MM. Preferably, the lock should also comply with the industry standard fitting apertures within the door.

In each case, it is difficult to comply with the space requirements imposed by the conditions described above because bolts need to extend adequately into the casing when fully extended to be properly supported and this imposes restrictions on integers competing for space adjacent the bolt and because the lock body must fit within a frame. These conditions place restrictions on the bolt, casing and other component depths and widths that also must observe minimum strength requirements. Furthermore, it is preferable that locks comply with Australian standards for: Security Doors, Glass Doors, Locksets and Fire Doors - these

standards defining minimum requirements strength, durability, corrosion resistance, ease of use and other functional and performance requirements.

Locks commonly employed in French doors in Australia do not provide compression, they are lockable only by key and it is not possible to lock the exterior lever while the interior is free to operated to enable egress and in many applications this is inconvenient and in some applications it is unsafe.

Locks commonly employed in security doors in Australia do have locking by interior locking lever (snib lever) but do not provide for locking of the exterior lever while retaining the interior lever free to be operated to enable egress.

The inventions herein, include locks that address the inadequacies described.

The inventions herein, comprise improved complete locks and improvements for locks for displaceable wings that are not just limited to addressing the above described inadequacies of common Security and French Doors.

Summary of the Invention Some Claims defining the Invention Are:

According to the invention there is a lock

According to the invention, there are locks substantially as described herein with reference to and as illustrated in the accompanying drawings.

According to the invention, there are improved complete locks for displaceable wings and improvements for locks for displaceable wings substantially as described herein with reference to and as illustrated in the accompanying drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Definitions and Conventions Employed

This specification and the provisional applications associated with this application, describe inventions comprising improved complete locks for displaceable wings and improvements for locks for displaceable wings that (for convenience) are referred to herein as "locks". Throughout this specification and claims which follow, unless the context requires otherwise, the word "locks" or variations such as "lock" will be understood to imply the inclusion of complete locks for displaceable wings and improvements for locks for displaceable wings that are transportable into other locks and locking devices without being limited to the complete locks described herein.

This specification describes locks substantially as described herein with reference to and as illustrated in the accompanying drawings.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Throughout this specification and claims which follow, unless the context requires otherwise, the positional prepositions such as rear, forward are used to assist in description of the preferred embodiments and with reference to the accompanying drawings and have in general no absolute significance.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "preferably" or variations such as "prefer" does not mean nor infer that that the inventions described in the "Description of the Preferred Embodiments" are necessarily restricted to the form of an integer or collection of integers referred to as preferred. Preferably means, one of multiple acceptable alternatives.

Throughout this specification and claims which follow, unless the context requires otherwise, the words wing embraces both doors and windows.

Throughout this specification and claims which follow, unless the context requires otherwise: **latching** means displacement of an engaging member against biasing means by an engageable means and subsequent displacement of the engaging member into engagement with the engageable means under the action of a **biasing means**, [(within this application) for hinged doors this comprises displacement of a latch bolt or {advanced latch bolt and an auxiliary bolt} towards the lock casing by the strike plate and subsequent displacement of the latch bolt into the **aperture** of the **strike plate** (and in conventional forms this comprises displacement of the latch bolt by a curved or angled wing or lip of the strike plate), and for sliding wings this comprises 1) displacement of an engaging member having a hooking portion towards the lock casing and subsequent displacement of the engaging member behind a **shoulder** of the **catch plate** to enable the hook to overlap the shoulder whereby to longitudinally engage the catch plate, 2) displacement of an auxiliary bolt towards the casing to release an engaging member having a hooking portion to displace to a position behind a **shoulder** of the **catch plate** to enable the hook to overlap the shoulder whereby to longitudinally engage the catch plate, 3) displacement of an advanced latch bolt with hooking arms and an auxiliary bolt towards the lock casing by the catch plate and subsequent displacement of the latch bolt into the aperture of the catch plate and displacement of each hooking arm behind the peripheral edge of the aperture to overlap the peripheral edge whereby to longitudinally engage the catch plate; within this application a latch bolt is displaceable between a **fully extended position** in which it is engageable with an engageable means (commonly comprising an extended bolt within the aperture of a strike plate) and a **retracted position** where it is removed from the said engagement (commonly meaning withdrawn from the aperture), the retracted position coinciding

with the bolt being substantially within the casing and the fully extended position embracing a bolt that is substantially fully extended; a **latch-bolt** or **latch bolt** is an outwardly biased bolt capable of executing (or participating in) latching (and includes both rectilinearly displaceable and angularly displaceable bolts) and includes bolts having a leading end that is chamfered or otherwise profiled on one side to facilitate latching and includes **advanced latch bolts** that are restrained in a partly extended (pre-latching configuration) prior to latching and that are accompanied by an auxiliary bolt, said advanced latch bolts in some forms comprising a prism shaped bolt that in some forms include **counter-acting hooks**, said advanced latch bolts in some forms having a leading end that is chamfered, curved or otherwise profiled on both sides to assist or facilitate latching; an **auxiliary bolt** means an outwardly biased plunger that is operably associated with the advanced latch bolt; **unlatching** means withdrawal of the latch bolt from engagement with the engageable means, (for hinged door it commonly means withdrawal of the bolt from the aperture of the strike plate); an **unlatching lever** is a lever or knob that is hand operable to cause the latch bolt to become unlatched; **locking** means configuring the lock to restrain it from being unlatched and in some forms of locks employing deadlocking slides, it includes restraining the deadlocking slide in an operative position to thereby restrain the bolt from being inwardly displaced by the unlatching lever; **deadlocking** means to configure the lock to restrain the bolt from being displaced from the configuration that it assumes when engaged with the engageable means (in the case of a rectilinearly displaceable bolt for a hinged door, it commonly means restraining the bolt in a fully extended position), the deadlocking means is some forms includes a **deadlocking slide** that is displaceable to cooperate with the bolt to restrain it against displacement; **deadlocked** means the bolt cannot be displaced from the extended position by external forces; **deadlatching** means the bolt is automatically deadlocked during latching; **remote lock** means a locking means disposed from the lock that includes a remote bolt that is operably connected to the lock (often there is an upper and a lower remote lock situated above and below the lock); **French door** means a door comprising a frame with a glass in-fill and often configured in pairs, a second door that is normally closed and is secured by vertical bolts and a first door that has the lock body and operable levers, often they have a strip of compressible sealing material located on the edge against which the first door closes to prevent energy loss, in may forms the door comprises a hollow frame where the hollow within the frame is comparatively small in depth; **security doors** means a door comprising a hollow framed door with an in-fill of mesh or woven stainless steel where the hollow within the frame is comparatively small in depth and in width; **lock body** is the lock

portion fitted within the hollow frame of the wing, the lock body together with a strike plate, a pair of handle sets and a cylinder comprising a typical mortice lock; **depth** of lock body is the extent of the lock body in a direction parallel to the face of the door; **width** of lock body is the extent of the lock body in a direction at right-angles to the face of the door; **single cylinder** is a cylinder comprising a key operable barrel within a **cylinder housing** connected to a **first cam** (in one form and commonly having a radially protruding arm); **free-rotation-double-cylinder** comprises a cylinder sub-assembly comprising opposed barrels each connected with free movement to the same first cam such that the cam is free (between limits) to be angularly displaced while the barrels remain undisplaced, this type of cylinder being commonly used in security door locks in Australia to enable the cam to be displaced by either barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal while leaving the first cam in the locking position, (this type of cylinder being distinct from the more commonly used double cylinders that employ clutches and that do not have free rotation between the barrels and first cam); **clutched-cam-double-cylinder** comprises a cylinder sub-assembly comprised of opposed barrels each connectable without free movement to the same first cam such that the cam can be angularly displaced by a barrel while the other barrel remain undisplaced, the cylinder includes a clutch to select which barrel is the operative barrel, said clutch being operated by key insertion. In forms of both clutched and free rotation cylinders, the interior key operable is replaced by a hand and operable turn knob.

Description of the Figures

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig 1 is an isometric view of a wing with a lock supported adjacent an opening,

Fig 2 is an isometric view of handle assemblies and a lock body.

Fig 3 is a schematic side view of a lock body with the lid removed and placed beside the lock body, the bolt fully extended, the unlatching cam at the "undisplaced orientation" with the deadlocking slide upwardly displaced by the cylinder screw to be in the "undisplaced position",

Fig 4 is the lock of Fig 3 with the deadlocking slide upwardly displaced to deadlock the bolt and to be in the "second locked configuration",

Fig 5 is the lock of Fig 3 with the deadlocking slide further upwardly displaced to deadlock the bolt and to be in the "first locked configuration",

Fig 6 is the lock of Fig 5 when viewed from the other side

Fig 7 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt displaced to the retracted position by the unlatching cam,

Fig 8 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt in the "pre-latching configuration"

Fig 9 is the lock of Fig 1, with the bolt fully extended, the deadlocking slide in the "undisplaced position" position, the driver annulus fully displaced,

Fig 10 is an isometric exploded view of the lock of Fig 1 from one side

Fig 11 is an isometric exploded view of the lock of Fig 1 from the other side,

Fig 12 is the lock of Fig 1, but adapted to provide exterior lever locking and including an egress deadlocking slide and an egress locking cam – the lock being shown in the "third locked configuration",

Fig 13 is an isometric view showing the lock body and underside of the exterior handle assembly,

Fig 14 is the lock of Fig 1, adapted to include a common deadlocking slide and a deadlatching locking cam

Fig 15 is the lock of Fig 1, adapted to include a deadlatching deadlocking slide to be key operable

Fig 16 is the lock of Fig 1 adapted to be key operable to actuate remote locks

Fig 17 is the lock of Fig 16 without a bolt or unlatching levers and including a locking plunger,

Fig 18 is an isometric view of a prism like bolt,

Fig 19 is an isometric view of a chamfered prism like bolt,

Fig 20 is an isometric view of a chamfered bolt,

Fig 21 is an isometric view of a retracted prism like bolt with hooking arms,

Fig 22 is an isometric view of an extended prism like bolt with hooking arms,

Fig 23 is a plan view of the bolt of Fig 22

Fig 24 is a schematic side view of a lock where the elongated drive members comprise Bowden Cables.

Fig 25 is an isometric view of an improved strike plate.

Fig 26 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt is in a different "pre-latching configuration"

The inventions described herein relate to locks for displaceable **wings 1** supported adjacent an **opening 2** and one such wing is shown in Fig 1. The wing has a **closing edge 3** that in the closed position of the wing, is adjacent an **element 4** that helps defines the extent of the opening and the lock is mounted relative to this closing edge.

Some locks comprising mortise locks, include a **lock body 5** that is mounted within the door, the lock body including a **front plate 6** and an **engaging member 7** that is displaceable to engage with an **engageable means 8** mounted relative to the element.

Where the wing comprises a conventional hinged door, the closing edge is adjacent a **door jamb 9** and usually adjacent a **door stop** when the door is closed and the engageable means comprises a **strike plate 400**. Where the wing comprises a conventional sliding door (not shown), the closing edge is adjacent a door jamb when the door is closed and the engageable means comprises a catch plate.

In general, the locks described within this specification include; locks that are lockable by the cylinder and/or interior locking lever; deadlatching locks that automatically deadlock on latching; and locks where the exterior lever is unlockable by operation of the interior unlatching lever. The complete locks described herein employ many common components are can be described as a lock series.

Integers from which locks are comprised include, as shown in Fig 3, a **bolt 12, a front plate 5** (that in one form is as shown but in other forms having tab portions that extends upwardly from the top of the casing and downwardly from the bottom of the casing, each tab having a screw aperture to provide means of attaching the lock body), a **casing 13** that in some forms comprises **sides 14** attached to each other by internal **fixed portions 15** by **rivets 16** that comprise extensions of the fixed portions that have passage through **apertures 17** in the casing sides. The front plate is preferably attached by **screws 18** having passage through **screw apertures 19** in the front plate to engage in **recesses 20** in the fixed portions, while in other cases a **spacer 21** is between the front plate and fixed portions to provide a lock of increased backset. In other forms, the front plate, the internal fixed portions and a side comprise a single member such as a single casting.

The latch bolt comprises a **first portion 31** that has passage through a **bolt aperture 32** in the front plate and a **return portion 33** within the casing. The bolt includes a longitudinally elongated **support recess 22** having an **opening 23** on the inside end of the bolt. Supported by the rear-casing wall is a T member comprising a vertical **plate 24** that is supported in a slotted aperture of the rear wall and an orthogonal forward projecting **guide pin 25** (preferably cylindrical in form) that protrudes into the support recess to comprise a telescopic joint whereby to mate with that recess with working clearances whereby to help support the bolt – the bolt in rectilinearly displaceable bolts thereby being supported by the front plate, guide pin and sides of the casing. Bolts include **advanced latch bolts 34** characterized by a

pre-latching configuration and accompanied by an outwardly biased displaceable **auxiliary bolt 35** as shown in Fig 3 and 17.

The auxiliary bolt comprises a **first auxiliary bolt portion 36** that has passage through an **auxiliary bolt aperture 37** in the front plate and a **return auxiliary bolt portion 38** within the casing by which it is supported. The auxiliary bolt is outwardly biased by biasing means that in one form comprises a **spring 39** (Fig 3) that acts between the outer end of a **spring recess 40** within the auxiliary bolt and a **vertical wall 41** of a casing fixed portion as shown in Fig 3.

The return portion, has a sideways protruding shoulder preferably comprising a cylindrical **side pin 42** that engages with a **profiled side recess 43** of an adjacent **control rocker 44** that is located within the casing adjacent a sidewall and supported by a **pivotal joint 45** located beneath the latch bolt and auxiliary bolt and adjacent to the front plate (forward of the side pin) said pivotal joint defining a pivotal axis orthogonal to a side of the casing. The control rocker extends vertically and rearwardly from its pivotal axis to terminate in a free end portion that has a **control shoulder 46** that is engageable with the latch bolt (to restrain the bolt) when the bolt is in the pre-latching configuration as shown in Fig 8. The profiled side recess includes an inwardly and upwardly **ramped edge 47** that lies in the same vertical plane as the side pin. The parts are configured such that as the auxiliary bolt is inwardly displaced, the pin slides along the ramped edge to cause the control rocker to displace away from the bolt to cause the control shoulder to displace away from the bolt to enable it to be displaced to the fully extended position by bolt biasing means. The control shoulder is engageable in an **edge recess 48** in the under-edge of the bolt comprising a **slot 49** extending outwardly from a **slot end 50** and when the lock is in the pre-latching configuration the slot end surface is preferably defined by a **normal vector 51** that intersects the control rocker pivotal axis this geometry is characterised by the control shoulder being able to slide on the bolt surface without causing the bolt to displace and an outwards force on the bolt not giving rise to a moment on the control rocker.

The profiled side recess also includes a substantially vertical **forward shoulder 52** that lies in the same vertical plane as the pin (in front of the pin) and that extends upwardly from the control rocker pivotal axis. The parts are configured such that during outwards displacement (from the retracted position) of the auxiliary bolt, the side pin engages the forward shoulder to cause the control rocker to cause to the control shoulder to displace upwardly towards the bolt towards engagement with the bolt. In some forms of control rockers, the side recess includes a

substantially **horizontal elongation 53** that enables the auxiliary bolt to be inwardly displaced without substantially displacing the control rocker.

In some locks, the front plate can be removed to enable the control rocker to be removed to be replaced by another whereby to change the distance the auxiliary bolt latch bolt protrude front the front plate in the pre-latching configuration. In these locks the pivotal joint 45 comprises a horizontal cylindrical pin that is supported within a U shaped pocket of a fixed casing portion with the opening to the pocket abutting the front plate so that removal of the front plate provides accessibility to the pocket.

In normal usage, the bolt is fully retracted by unlatching lever operation as shown in Fig 7 and the wing is opened whereby to enable the auxiliary bolt to fully outwardly displace. Then, as the unlatching lever is reversed towards the undisplaced position, the bolt is outwardly displaced by biasing means. When the door is opened, the auxiliary bolt is outwardly displaced to bring the control shoulder into contact with the lower edge of the retracted bolt and as the bolt outwardly displaces it slides over control shoulder till the bolt edge recess presents itself and then the control shoulders enters bolt recess to restrain the bolt in the pre-latching configuration.

Integers include an **unlatching rocker 60** as shown in Fig 3, that is angularly displaceable about a **pivotal axis 61** orthogonal to the sides of the casing and between the latch bolt the unlatching cam/s described below. The unlatching rocker is supported by an unlatching rocker **shaft 62** that is some forms comprises a pinned extension of the casing and in other forms comprises a **rivet 63** that passes from one side of the casing to the other to both support the rocker and help fasten the casing sides, said unlatching rocker having a **first arm 64** extending upwardly from the pivotal axis to terminate in a **engageable shoulder 65** and a **second arm 66** extending downwardly to overlap the return bolt portion. In forms of the invention, the overlapping portion of the second arm includes a sideways protruding **drive pin 67** as shown in Fig 3 that locates in a **drive recess 68** in a side of the bolt.

Integers include means to outwardly bias the latch bolt that in one form comprises a **bolt torsion spring 69** supported around the unlatching rocker shaft that has a **free end 70** that acts on the second arm of the unlatching rocker (to outwardly bias it) and a **fixed end 71** restrained by the casing, the substantially cylindrical body of the spring being supported about the shaft.

Integers include operating means by which to displace the bolt towards the retracted position including at least one **unlatching cam 80** as shown in Fig 3, that is connected to a hand operable **unlatching lever 81** as shown in Fig 2. In some locks, the unlatching cam and lever are connected by a **shaft 82** that has passage through

an aperture in the side of the wing to mate within a **drive aperture 83** in the unlatching cam and a **drive recess 84** in the unlatching lever. Each unlatching cam has a downwardly extending **unlatching arm 85** that (towards its free end) has a **driving shoulder 86** that is rearward of the rocker first arm and within the same plane so that forward displacement of the driving shoulder (by downwards unlatching lever displacement) causes the first arm of the unlatching rocker to displace in a forward direction to cause the second arm to rearwardly displace to cause the bolt to retract.

Each unlatching cam is preferably supported by at least one sideways protruding **cylindrical portion 87** that extends into a **circular aperture 88** in a side of the casing -this cylindrical portion also preferably including a portion of the drive aperture. In some locks, there is only one unlatching cam connected to a **single shaft** that extends between an **exterior unlatching lever 89** and an **interior unlatching lever 90** as shown in Fig 2, while having passage through the mating drive aperture in the unlatching cam and that has passage through apertures in the sides of the wing.

Integers include a **deadlocking slide 100** as shown in Figs 4 and 5, that is displaceable to and from a deadlocking configuration. The deadlocking slide has a **leading end 101** that is co -operable with the latch bolt to restrain the bolt from being displaced to the retracted position. In some forms, the deadlocking slide has an **engaging shoulder 102** that is engageable behind an **engageable shoulder 103** of the bolt - the engaging shoulder laying in the same vertical plane as the engageable shoulder that is parallel the casing side. The configuration in which the bolt and slide cooperate as shown in Figs 4 and 5, is referred to herein as the **deadlocking configuration** and when so engaged the deadlocking slide can be said to be in a deadlocking position [this deadlocking position actually embracing a limited range of deadlocking slide positions over which the bolt and slide so cooperate] and [the specification embraces the latch bolt being within a limited range of extended positions over which the bolt and slide cooperate and from which the bolt cannot be displaced]..

In some locks the deadlocking slide is displaceable by operation of a **locking member 104** shown in Fig 2, that in some locks comprises an interior rectilinearly displaceable hand operable member supported relative to the interior handle assembly that has passage through an aperture in a side of the wing to be connected to the deadlocking slide. In other locks the locking member comprises a hand operable angularly displaceable **locking lever 105** (commonly called a **snib lever**) that is connected by a **spindle 106** that has passage through an aperture in a side of

the wing to an angularly displaceable **locking cam 107** within the casing. The locking cam is preferably supported by **cylindrical portions 108** that extend into **circular apertures 109** in the sides of the casing. The locking cam has a **spindle aperture 110** to mate with the spindle. The locking cam also includes a locking arm having a displaceable **free end portion 111** that overlaps a portion of the deadlocking slide that has a sideways **protruding pin 112** that is within a substantially **horizontal slot 113** within the deadlocking slide.

The deadlocking slide in some locks and those of the figures is supported by a sideways protruding shoulder that is within a vertically elongated slot of a casing side and it is supported by a rearwardly extending foot portion that abuts the inside face of the casing rear wall and in operation it slides along this wall.

Integers further include an angularly displaceable **first cam 120** that is operably associated with the deadlocking slide and that is actuateable to displace the deadlocking slide to and from the deadlocking configuration. Some locks have deadlocking slides include a **drive recess 121** having an **upper drive face 122** on which the first cam arm acts to drive the deadlocking slide towards the deadlocking configuration and a **lower drive face 123** on which the first cam arm acts to drive the deadlocking slide from the deadlocking configuration and an **exit shoulder 124** (preferably comprising an angled face) connected to the upper drive face disposed such that when in the lock is in a **first locked configuration**, the first cam **end face 125** (a face of constant radius) abuts the exit shoulder so that a force applied on the first cam by the deadlocking slide when an attempt is made to move the deadlocking slide from the deadlocking configuration (as might occur in an attempt to rotate the snib lever) has a **direction 126** that passes through the **pivotal axis 127** of the first cam so as not to give rise to a moment that acts on the first cam and so that the first cam cannot be rotated by the deadlocking slide; and the first cam in this configuration restrains the deadlocking slide from displacing from the deadlocking configuration.

The lock can be displaced into and out of a **second locked mode or configuration** (characterized by the first cam arm being within the drive recess as shown in Fig 4) by actuation of the interior locking lever and by actuation of the first cam, but the lock can only be displaced from the first locked mode described above and as shown in Fig 5, by actuation of the first cam (the lock being displaceable into and out of the first locked mode by actuation of the first cam).

In some locks, the first cam is biased against displacement from the drive recess. In forms of these latter locks, the deadlocking slide supports a torsion **slide spring 128** having a **free arm 129** that extends rearwardly to intersect the locus of movement of the end of the first cam arm and a **fixed end 130** restrained within the

deadlocking slide. The torsion spring is preferably supported within a **cylindrical recess 131** in a side of the deadlocking slide and the spring arm preferably lies in the same plane as a central plain of the lock body and first cam. Parts are configured such that the first cam cannot leave the drive recess during normal operation without displacing the free arm against biasing force and when the lock is in the first locked configuration, the first cam arm and slide springs arm are substantially orthogonally disposed as shown in Fig 5.

Some locks, (not including deadlatching and egress locks) include a deadlocking slide having an adapted leading end that includes a ramped (or otherwise profiled) shoulder that extends inwardly while extending upwardly. The said slide is configured such that as the deadlocking slide is displaced towards the deadlocking position, the ramp engages with the lower rear corner of the engageable shoulder of the bolt to urge and displace the bolt outwardly – the action taking place by dint of the ramp sliding over the corner to exert a force having an outwards component. In these locks the deadlocking configuration corresponds to a fully extended bolt as defined above. This type of deadlocking slide is particularly applicable to the ramping strike plates described below.

Where the cylinder comprises a **free-rotation-double-cylinder 136** a **cylinder screw 137** is employed to restrain the lock cylinder within the lock body, this screw having passage through the lock body to be engage in a **threaded aperture 138** in the lock cylinder, and in these forms the screw also preferably performs the function of restraining the first cam against leaving the drive recess by downwardly displacing; the screw does this by restricting the downward displacement of the deadlocking slide from the undisplaced (unlocked) position. In usage, after the cylinder has been inserted in the cylinder aperture in the lock body, the first cam is rotated to be within the drive recess at which time the cylinder screw is inserted to displace the deadlocking slide away from the initial position and to the undisplaced position (corresponding in some cases to the ball being in aperture), this undisplaced position not allowing the first cam to be displace downwardly to leave the drive recess.

Integers further includes **drive means 140** as shown in Fig 7, to operate at least one remote engaging member, said means including a driver member supported within the casing that is operably connected to each unlatching lever so that upwards displacement of a lever causes the driver member to displace to actuate each remote engaging member to an operative position. In some locks, upwards displacement of an unlatching lever causes the bolt to be driven to the fully extended position and in other locks again employing a latch bolt, upwards

displacement also causes the latch bolt to be driven to the fully extended position if it has not been fully displaced by the biasing means. In these locks, downwards lever displacement causes the driver member to actuate each remote engaging member from the operative position while causing the bolt or latch bolt to retract.

In some locks there is an upper and a lower remote engaging member each operably connected to the driver member by an upper and a lower elongated drive member respectively. The driver member in some locks is connected directly to one or both elongated drive members and in other locks the driver member is operably connected to one or both drive members by one or a pair of interspaced drive slides supported within the casing. In some locks there is a pair of counteracting drive slides (an upper and a lower) that is supported within the lock casing and which are connected to the driver member.

Preferably, the driver member comprises an angularly displaceable **driver 142** as shown in Fig 9, comprising an angularly displaceable **driver annulus 143** having a **base 144** and an annular **sidewall 145** defined in part by a **pivotal axis 144** orthogonal to the plane of a casing side. The driver annulus is preferably supported within [and in some forms by] a raised casing **annular wall 144** that completely or partly surrounds the drive annulus and in some forms, the driver annulus is supported by an axial cylindrical sideways protrusion of the base 144 comprising a **pin 145** that locates within a circular **aperture 146** in a side of the casing (to comprise a pivotal joint)

In some locks, there is means of releaseably restraining the driver member in the fully displaced position and to restrain the driver member in the undisplaced position as shown in Fig 9, said means including **recesses 173** within the side of the driver annulus and a **ball 174** biased towards the annulus by **spring 175** wherein the spring and ball are located within a substantially **radially extended recess** within the casing that intersects the recess for the driver annulus. When the driver annulus is in either the fully displaced or undisplaced position the ball is aligned with one of the radial recesses and a moment has to be applied to the driver annulus to displace the ball from the recess whereby to enable displacement of the driver.

In some locks 1) the upper and lower elongated drive members are to be counteracting, and 2) the operative configuration is to correspond with outwardly displaced drive members, and 3) the operative configuration corresponds with upwardly lifted unlatching lever. In these locks, a first pivotal joint of the driver annulus (that is operably connected to the upper remote engaging member) is rearwardly disposed of the pivotal axis and a second pivotal joint (that is operably connected to the lower remote engaging member) is forwardly disposed. The first

and second pivotal joints in one form comprise pin joints (and herein the terms are used synomously) comprising a pin extending sideways from one member to locate within the other member or a pin that extends from within apertures in each member to be relatively displaceable to at least one, importantly the first and second joints accommodate relative angular displacement. The term pin herein embraces a right angled return portion of a drive slide comprising a vertically elongated cylindrical members.

In some locks complying with the above requirements, and as shown in Fig 9, the driver annulus is connected directly to the **upper elongated drive member 146** by a **first joint 147** and it is operably connected by a **second joint 149** to a **lower elongated drive member** by a **lower drive slide 148.** In some locks (not shown), the lower drive slide comprises a flat, plate-like vertically elongated member having a sideways protruding pin (that is part of the second joint) that is supported within the casing adjacent a side (between a side and the bolt) and that extends from the bottom of the casing to provide a joint enabling connection to the lower elongated drive member. Where there is insufficient space within the casing for the lower drive slide described above, the **lower drive slide 148** is connected to the second joint by an intermediate mechanism described below.

In some locks, the driver and each unlatching cam are closely disposed (to require less space within the casing and for other reasons) with this proximity being defined in-part by their pivotal axii being closely disposed. In some locks, the cylindrical portion of each unlatching cam is supported in an aperture in a casing side that is within the annular driver circumference and in cases where the driver member takes the form of a driver annulus, each unlatching cam is supported within the driver annulus side wall. In some locks, (not shown) the driver member pivotal axis intersects each unlatching cam, the driver annulus is without the pin 145, and the driver annulus is supported by the annular wall.

The driver side wall as shown in Fig 9, includes a **locking shoulder 151** and an **unlocking shoulder 152** that are defined in-part by a **driver drive recess 153** therebetween and each unlatching cam includes a **drive arm 150** comprising (in an undisplaced disposition) a substantially horizontal radial extension that extends from the unlatching cam into the driver drive recess to overlap the side wall. The locking and unlocking shoulders and are angularly spaced such that when the driver member is undisplaced and each unlatching lever is undisplaced, each drive arm abuts the locking shoulder and when an unlatching lever is lifted to fully displace the driver member (to actuate to actuate remote engaging members to the operative position) ethe drive arm engages the locking shoulder to displace it downwardly, and when the

actuated lever is then returned to the undisplaced position each drive arm abuts the unlocking shoulder, (in egress locks the other unlatching cam and other unlatching lever remain undisplaced while the active lever and unlaching cam are displaced) When the lock is unlatched by pushing a lever down, a drive arm displaces the unlocking shoulder upwardly to the undisplaced position to displace the remote engaging members from the operative position, during which displacement the unlatching rocker is displaced to displace the latch bolt to the retracted position - the fully retracted latch bolt coinciding with an undisplaced driver member.

In locks, (where the latch bolt first portion is to have maximum width within the constraints of the casing width) there is no space between the casing sides and the latch bolt for other components, and the lower drive slide is disposed rearwardly of the casing to comprise a vertically elongated, substantially rectilinearly displaceable drive slide as shown in Fig 9, and preferably comprising a substantially cylindrical member. In these locks, the second joint is connected by an angled **intermediate member 154** to the **free end 155** of an **intermediate rocker 156** by a **pin-joint 157,** said rocker extending from a **pivotal joint 158** shared with the casing (and located adjacent the front plate) to its **free end 159** disposed rearwardly of the casing. The free end also shares a **pin joint 160** with the rearwardly disposed **lower drive slide 161** that extends from the pin joint towards the lower end of the casing. The intermediate member and rocker each have a pivotal orthogonal to a side of the casing.

In normal usage, rotation of the driver annulus in a locking direction by lifting the free end of an unlatching lever drives the upper elongated drive member upwardly and the lower drive slide downwardly by causing the intermediate member to pull the rocker downwardly. Preferably the upper drive member and lower drive slide displace simultaneously in opposite directions and preferably the total displacement of each is identical (although at any intermediate position this may not be so) - the lengths of the intermediate member, the length of the rocker and the location of the joints being configured to provide such as shown in the figures. Rotation of the driver member in a unlocking direction by lowering the free end of an unlatching lever, drives the lower drive slide upwardly and the upper drive member downwardly.

Where the bolt is to be outwardly displaced (if it is not already so) by actuation of either unlatching lever, the driver annulus is further configured such that when the driver annulus is fully displaced in a locking direction a shown in Fig 9, a **secondary driven shoulder 170** of the unlatching rocker abuts a **secondary driving shoulder 171** of the driver annulus and when the driver is undisplaced a shown in Fig 3, the

secondary driven shoulder of the unlatching rocker is disposed from the secondary driving shoulder of the driver so as not to affect its movement. And when the latch bolt is partly extended and the driver annulus is driven to the fully displaced position, during this displacement, the secondary driven shoulder is engaged by the secondary driving shoulder to be driven to a configuration corresponding to a fully extended bolt - this functionality being particularly applicable to doors having seals.

In some locks as shown in Fig 6, (but not including some egress locks) the deadlocking slide is connected to a vertically elongated **driver locking slide 162 by** a pin joint comprising an **aperture 166** in the slide and a protruding cylindrical **pin 167** of the deadlocking slide foot portion that has a **stop shoulder 163** that is displaceable into a **driver locking recess 164** of the driver to restrain it from being displaced from the fully displaced position corresponding to fully outwardly displaced drive slides.

In some locks, there is also a **subsidiary locking recess 165** of the driver that is utilized to restrain it from being displaced from the undisplaced position (corresponding to retracted drive slides and a lock in the first locked configuration). In should be understood that the locking provided by the driver locking slide is additional to the locking provided by the deadlocking slide cooperating with the bolt as described above.

Preferably, the first and second joints (pivotal joints) are equidistance (by a radius **r**) from the driver annulus pivotal axis and on opposite sides of the pivotal axis and preferably the first and second joints are in the same horizontal plane when the driver is angularly disposed half way between the undisplaced and fully displaced positions. In other forms, the joints comprise sideways protruding pins of the driver annulus that extend into substantially horizontal slots of each drive slide.

Preferably, the lower drive slide extends vertically within a **casing channel 351** along the inside rear casing wall of the casing to pass through an **aperture 352** in a **horizontal wall 353** disposed towards the lower end of the casing whereupon to **dog-leg 354** so that the lower end portion is substantially midway between the casing sides. The lower end portion supports an **fitting 350** with external threading 356that can receive and mate with an internally threaded end of the lower drive member; the fitting having a longitudinally elongated **aperture 355 and a cone portion 366** through which this end portion passes to be crimped to prevent the fitting from being removed.

In some locks, the drive members comprises hollow tubes and the fitting comprises a **cylindrical members 363** connected to a **disc-like portion 364** of

larger diameter that is **slotted 365** to receive the orthogonal (dog leg) portion of the drive slide to restrain the fitting against rotation as the tube is wound on.

The cone portion or adjacent crimped portion is preferably connected to a flexible elongated **cord 368** that extends along the inside of the lower drive member (a tube). During fitting, after the lock body is within the doorframe, the cord is pulled tight to guide the tube into engagement with the threaded fitting by being slid along the tensioned cord.

The same type of system may be employed in relation to the upper drive member, but preferably, the upper drive slide comprises an adapted drive slide that is connected directly to the upper drive member by a rigid joint – the adapted drive slide having a return portion that is connectable (during lock installation) within the aperture in the driver annulus to comprises the first pivotal joint. The adapted drive slide also includes a **dog-leg 361** to enable the drive member to be halfway between the casing sides.

In locks where the remote locks are connected by Bowden Cables and the cables are to operate in the same direction, the lower inner cable is connected by a return portion comprising part of an **alternative first joint 369** that is substantially coaxial with the first pivotal joint but on the opposite side of the driver annulus from the first joint and the upper inner cable is connected by a return portion comprising part of the first joint, (these joints comprising the return portions of the inner cable within an aperture in the driver annulus as described above). In these locks, the casing channel 351 is adapted to provide an **open channel 370** that is open from the rear of the casing and that extends from the driver member to the lower end of the casing to provide passage for the lower Bowden Cable.

Adjacent to the driver member there is a **slotted aperture 374** to receive and restrain the **end 372** of the **lower outer cable 373** and adjacent to the driver member there is a **slotted aperture 377** to receive and restrain the **end 378** of the upper **outer cable 373.**

In some locks, the inner Bowden cable as shown in Fig 24, comprises an semi-flexible **cable 382**, within a **rigid tube 383** while in other cases the outer cable is also semi-**flexible 384.** In some locks, the inner cable comprises a single strand of wire and in other it comprises multiple strands.

As described above, levers of locks having a driver member preferably are displaceable in both angular directions and preferably they biased towards this undisplaced position. In some locks, each lever includes a substantially cylindrical **shank portion 180** that is supported within a hollow annular horizontally elongated **shell 181** comprising an extension to the back plate having an opening to the face of

the back plate and terminating within the underside of the backplate in a circular **annular end 182**. The shank preferably has a sideways protruding **retention shoulder 183** and the face and shell of the backplate are longitudinally **slotted 184** to provide passage for the retention shoulder – the slot and retention shoulder being configured such that in normal operation they are never aligned. In usage, the shank is fed through the slot and it is then rotated so that the retention shoulder abuts the annular end to retain the lever. A **cupped member 185**, enveloping the shell has an axial **aperture 186** providing passage to and mating with the **drive shaft 187** that also mates within an axial **drive recess 188** of the shank to thereby operably couple the cupped member and lever.

The cupped member includes a downwardly disposed stop slot described below and horizontally opposed side apertures disposed from the pivotal axis of the lever (that is coaxial with the pivotal axis of the cupped member, drive shaft and shank). One of the **apertures 189** (disposed towards the lever arm) is occupied by a right-angled **return portion 190** of a vertically elongated extended **tension spring 191** that is connected at the upper end to a **pinned extension 192** of the underside of the back plate, said spring urging the cupped member (and hence lever) to rotate about its axis. The other **apertures 193** (disposed away from the lever arm) is occupied by a right-angled **return portion 194** of a vertically elongated much stronger (substantially unextended) **tension spring 195** that is connected at the upper end to another **pinned extension 196** of the underside of the back plate, said spring acting as a stop to restrain the cupped member against rotation (from the undisplaced position of the cupped member) by the softer spring. In usage, downward displacement of the lever causes the softer spring to stretch more (urging the cup towards the undisplaced disposition) while the stronger spring exerts no force being displaced upwardly substantially as a rigid member as the **U shaped end 197** slides behind the **outer head 198** of the pinned extension in a crank-like manner; and upwards displacement of the lever causes the harder spring to stretch and the softer spring to become less stretched with the overwhelming force of the stronger spring urging the cup towards the undisplaced disposition. This springing method for the levers is applicable to all locks described herein. In usage (when the drive shaft is assembled through the cupped member), the cupped member is preferably supported by the shaft with operating clearance between the cupped member and annular shell so that friction is minimized.

Although (in the locks described immediately above) there is provision for operating remote locks, it will be appreciated that they may not, and need not, always be employed with the locks described above as the locks operate quite satisfactorily

without remote locks – for this reason it can be said that the remote locks or remote engaging members are operably connectable to the driver (and lock) because they can be connected when so desired.

In the context of this specification, a remote lock or remote engaging means comprises a remote engaging member that embraces a simple plunger like member, each said remote engaging member being connectable directly or indirectly to a vertically elongated drive member that is connectable to a drive slide or to the driver annulus and they include more sophisticated device where a remote engaging member is actuated by an intermediate mechanism that in some cases includes a remote lock casing and in some cases includes means for separately deadlocking the remote engaging member and where independent deadlocking is effected by displacement of the driver annulus. The operative configuration of a remote engaging means is that in which it acts to restrain the wing in which it is supported and in the case of a plunger-like member it is the extended position where it protrudes from the wing.

Integers further include a **ramping latch bolt** having a first portion comprising a substantially prism-like solid as shown in Fig 19, that is adapted to be slightly angled inwards on both sides to assist the bolt enter the aperture in the catch plate or strike plate wherein **each side 301** commencing at a position disposed towards the front plate (of the fully extended bolt) slopes inwardly towards the leading end to (over the length of the bolt) reduce the bolt width on each side by length **["wr"]** . These bolts preferably include at least one full width **bridge portion 301** within the generally angled sides described above, that is defined in-part by two parallel horizontal planes, this bolt being employed with a **ramping strike plate 401** that includes a substantially rectangular aperture as elsewhere described having a width substantially the same as the bolt (plus operating clearance) but further including an additional **clearance aperture 390** shown in Fig 25, extending exteriorly from the aperture and in a position adjacent each bridge. The clearance apertures extend horizontally for a distance not less wr defined above and for a vertical height not less than the height of the bridge plus the vertical clearance between the aperture and general bolt. This configuration enables the bolt of a lock in a partly open wing to latch whereby to enter the aperture when a hinged wing is partly open. This functionality pre-disposes this bolt to be driven outwardly by deadlocking slide displacement and/or by actuation of the driver annulus as described above. These forms of bolts (both advanced and otherwise) find application in wings that must be closed against a seal and that require a force to be applied to fully close the wing. In usage the wing would be closed by hydraulic closer or by hand to cause the bolt to

latch and the unlatching lever would then be lifted to actuate the bolt and drive remote engaging members to the operative position.

The above described integers and combinations thereof are configurable so:

- the upper and a lower drive slides each displace within a 15 MM range
- the upper and lower elongated drive members each displace within a15 MM range
- the bolt when fully extended protrudes 16 MM from the casing
- the bolt has a width of about 12. MM
- the lock body has a width of 15.5 MM
- the backset is 30 MM
- the casing depth is 40 MM
- the unlatching levers rotate less than 40 degrees to unlatch
- the distance between cylinder and lever axii of 85 MM
- the bolt is in the middle of the front plate
- the front plate is interchangeable
- the control rocker interchangeable
- the backset can be changed by the addition of spacers
- the casing length does not greatly exceed 155 MM

LOCKS DERIVED FROM THE INTEGERS DESCRIBED ABOVE

Standard locks having a double cylinder, locking lever and advanced latch bolt

These locks include a lock body comprising a casing, front plate, an advanced latch bolt, auxiliary bolt, an interchangeable control rocker, a deadlocking slide having a slide spring, a single unlatching cam, an unlatching rocker, a driver annulus and electively, a driver locking slide; an interior and an exterior handle set each including an unlatching lever connected by a single shaft, and electively, an interior locking lever connected to a locking cam by a spindle; and a free-rotation-double cylinder and cylinder screw – the lock being characterized by a first and a second locked configuration.

These locks are configurable to include an upper and a lower drive member each connected to a remote engaging member, a lower drive slide, an intermediate member and an intermediate rocker.

The locks are also configurable to have a ramping latch bolt and ramping strike plate or a bolt with hooking arms or to have the other bolts described herein or to be otherwise configured as described herein.

In some locks, (including those not having a slide spring) the deadlocking slide supports a spring loaded (sideways displaceable) **ball 132** as shown in Fig 3,

that is engageable in **recesses 133, 134, 135** in a side of the casing, said recesses corresponding respectively to an undisplaced deadlocking slide and a deadlocking slide in the second locked configuration and the first locked configuration. Both locked configurations correspond to a deadlocking configuration but in the second locked configuration the deadlocking slide has not been displaced upwards sufficiently to enable the first cam to depart the drive recess; in the first locked configuration the first cam is departed from the drive recess. Where a slide spring is employed, the position of the deadlocking slide in the second locked configuration is the same as it is in the first locked configuration.

In locks not to have keyed locking to the first locked configuration, the lock includes a **stop pin 199** that passes between casing sides in the locus of displacement of the deadlocking slide to restrain the deadlocking slide from being displaced upwardly from the position corresponding to the second locked configuration.

Egress locks having a lockable exterior unlatching lever

In egress locks as shown in Fig 12 and 13, the interior locking member is operably connected to a stop blade within the exterior handle assembly – the locking member being displaceable to displace the deadlocking slide into the deadlocking configuration while simultaneously displacing the stop blade to operably engage the exterior lever to restrain the lever against displacement. The deadlocking slide is displaceable from the deadlocking configuration by rotation of the interior lever as described below. In egress locks having a slide spring to restrain the first cam in the drive recess, the lock is characterised by both a third and first locked configuration.

In egress locks, the exterior unlatching lever is connected to an **outer unlatching cam 200** by an **exterior shaft 201** and the interior unlatching lever is connected to an **inner unlatching cam 202** by a separate **interior shaft 203** - each shaft mating with its associated unlatching cam and lever and each unlatching cam being supported adjacently each other and each having an unlatching arm as described above and each being independently actuateable to cause the latch bolt to retract and when each includes a drive arm as described above, each is independently actuateable to actuate the driver annulus between its extreme dispositions.

In egress locks, having an angularly displaceable locking member, the lock includes an **egress locking cam 204** through which the spindle has passage (and with which the spindle mates) to mate within a spindle recess of a **lever locking cam 205** supported on the underside of the **exterior lever backplate 206.** This egress locking cam is operably connected with free displacement to an **egress deadlocking**

slide 208 (as described below) by an arm having a displaceable **free end portion 209** that overlaps a portion of the egress deadlocking slide, said free end portion having **upper and lower drive shoulders 210 and 211** respectively within a substantially **horizontal slotted recess 212** within the egress deadlocking slide to mate with relative free displacement such that when the locking lever is in a disposition corresponding to a locked exterior lever, the egress deadlocking slide is in a third locked configuration (corresponding to a deadlocking configuration), where the upper shoulder is adjacent the upper shoulder of the slotted recess and there is free space between the lower shoulder and the upper shoulder of the slotted recess to enable the egress deadlocking slide to be displaced by cylinder to the first locked configuration without trying to cause the locking cam to angularly displace (and in fact it is restrained by the spindle).

The egress deadlocking slide includes a **deadlocking shoulder 213** that lies in the same vertical plane (a plane parallel a casing side) as the engageable shoulder of the bolt and that is engageable with the engageable shoulder to restrain the bolt. Adjacently, there is a ramped **unlocking shoulder 214** that lies in the same plane (a plane parallel a casing side) as the unlatching rocker. In the **third locked configuration** both shoulders are rearwardly disposed of the bolt, the deadlocking shoulder to restrain the bolt from being inwardly displaced and the unlocking shoulder to be displaceable by the unlatching rocker as it displaces to retract the bolt. The unlocking shoulder is engageable by a **nose portion 215** of the second arm of the unlatching rocker as it rearwardly displaces to retract the latch bolt. In these locks, the bolt drive recess is of sufficient width to enable the unlatching rocker drive pin to freely displace sufficiently (while the bolt remains undisplaced) to enable the nose portion to slide up the unlocking shoulder to displace the egress deadlocking slide downwardly whereby to displace the deadlocking shoulder from behind the engageable shoulder to enable the bolt to inwardly displaced by further unlatching rocker displacement while simultaneously displacing the locking cam to drive the spindle to unlock the exterior lever.

[Alternatively if deadlocking is not required, the egress deadlocking slide includes a ramped or radiused unlocking shoulder that in the third locked configuration is rearwardly disposed of the latch bolt and that is engageable by the lower rear corner portion of an inwardly displacing bolt to cause the deadlocking slide to downwardly displace to cause the locking cam to be rotated in an anticlockwise direction to actuate the lever locking cam in an unlocking direction]

The lever locking cam has at least one **arm 217** operably connected to a **stop blade 218** that is upwardly displaceable by the arm 217 to engage in a **stop slot 219**

of a cupped member **220** operably connected to the **shaft portion 221** of the exterior lever. The components are configured such that when the locking lever and spindle are angularly undisplaced, the exterior lever is unrestrained but when the locking cam has a disposition corresponding to the third locked configuration, the stop blade is within the stop recess restraining the exterior lever against displacement. In usage, when the interior lever is pushed down to retract the bolt, the deadlocking slide is displaced to angularly displace the locking cam to angularly displace the spindle to unlock the exterior lever. As will be appreciated, the exterior lever can be both locked and unlocked by the cylinder from either side and by the locking lever.

The stop blade preferably comprises a part of a rectilinearly displaceable **stop slide 222** supported between the **side walls 223** of the exterior back plate and biased by compression **spring 224** towards the stop lever locking cam – said spring being supported within a vertically elongated spring **slot 225** of the stop slide to act downwardly on the **lower end 226** of the spring slot while acting upwardly on a **screw or screw boss 227** that intersects the spring slot to retain the slide adjacent the back plate. There are preferably a pair of horizontally opposed arms disposed on opposite sides of the **spindle pivotal axis 228**, each arm terminating in an engaging profiled **shoulder 229** and the **horizontal lower edge 230** of the stop slide includes a pair of **recesses 231** one recess engageable by one shoulder 229 and the other recess engageable by the other shoulder. When the stop slide is undisplaced, each shoulder abuts the horizontal lower edge of the stop slide and when the lever locking cam is in a displaced position corresponding to the third locked configuration, one of the shoulders is within a recess. The recesses and shoulders are configured such that the stop slide biased by the spring cannot dislodge a shoulder from its recess (this being possible by spindle rotation alone) because the vector defining the normal to the surface of the recess at the point of contact by the shoulder is configured to pass through the pivotal axis of the lever locking cam. It will be appreciated that this arrangement also biases the locking lever towards an undisplaced position.

In egress locks not to have keyed locking to the first locked configuration, the lock includes a **stop pin 199** that passes between casing sides in the locus of displacement of the egress deadlocking slide to restrain the deadlocking slide from being displaced upwardly from the position corresponding to the third locked configuration (a deadlocking configuration in which the first cam is restrained within the drive recess).

Where keyed locking to the first locked configuration is required, the stop pin is omitted and the deadlocking slide supports a spring loaded (sideways displaceable) **ball 132** as shown in Fig 3, that is engageable in **recesses 133, 134,**

135 in a side of the casing, and recesses 133 and 134 are connected by an elongated slot to provide free movement for the ball between the recesses, said recesses corresponding respectively to an undisplaced deadlocking slide and a deadlocking slide in the third locked configuration and the first locked configuration. Both locked configurations are deadlocking configurations but in the third locked configuration the deadlocking slide has not been displaced upwards sufficiently to enable the first cam to depart the drive recess.

Deadlatching locks operable by unlatching levers

In some locks having an advanced latch bolt, the bolt automatically deadlocks when it extends to the fully extended position as shown in Fig 14 and 15 and in locks employing a slide spring they are characterized by a second and first locked configuration. These locks employ a **common deadlocking slide 243** having a **spring wing 240** and there is a **spring recess 241** (Fig 7) within the casing and a **spring 242** that fits within the spring recess to act on the spring wing to urge the common deadlocking slide towards the bolt. With a view to standardising components, this common deadlocking slide has also been designed as a substitute for the deadlocking slide described above in which locks the spring wing performs no function.

In these locks, the locking cam comprises a **deadlatching locking cam 249** that is connected with free movement to the common deadlocking slide by a locking arm having a displaceable **free end portion 244** having **upper and lower drive shoulder 245 and 246** respectively within a wide substantially **horizontal slot 247** within the common deadlocking slide whereby to mate with relative vertical free displacement and with relative free sideways displacement such that when the common deadlocking slide has been displaced against biasing (from the deadlocking configuration) to the undisplaced position by the locking lever, the locking lever and cam can be further angularly to cause the lower shoulder to leave the drive recess by sliding along a **lower exit shoulder 248** of the slot, said exit shoulder in this configuration being defined in part by a vector normal to the surface that passes through the pivotal axis of the locking cam. When so configured, the common deadlocking slide is restrained against displacing towards the bolt by the locking cam this configuration being a spring-loaded configuration.

The first cam is also actuateable to downwardly displace the deadlocking slide against biasing means (to cause the upper shoulder of the common deadlocking slide slot) to displace the upper shoulder 245 downwardly.

The lock is further configured such that and when the common deadlocking slide is close to its undisplaced position, the lower drive shoulder is adjacent the

lower exit shoulder, and a downward protruding **accelerator shoulder 250** of the horizontal slot (that disposed closer to the pivotal axis of the locking cam than the free end portion) is adjacent the locking cam arm, and further downwards displacement causes the locking cam arm to be displaced downwardly by the accelerator shoulder and so that the lower drive shoulder is displaced to overlap the lower exit shoulder (while not abutting it). When the deadlocking slide ceases to be acted on by the first cam, the deadlocking slide is upwardly displaced by the spring till it engages the overlapping lower drive shoulder that is now within its locus of movement. This causes the deadlocking slide to be restrained against further displacement; and in this configuration, the accelerator is disposed from the locking cam arm to enable the arm to be displaced to free the deadlocking slide.

In usage, when the bolt is in the pre-latching configuration the locking cam can be actuated to release the deadlocking slide to abut the bolt so that when the bolt extends on latching (during which the bolt slides over the common deadlocking slide while restraining it against biasing means), the deadlocking slide is displaced by biasing means to deadlock the lock. To unlatch the lock either the locking lever or cylinder can be operated to drive the common deadlocking slide from behind the bolt and into the spring loaded configuration after which an unlatching lever is operated to unlatch the lock. However, if the lock has been locked to a first locked configuration it can only be unlocked from this configuration by actuation of the first cam.

In some deadlatching locks not to have locking to the first locked configuration, the lock includes a **stop pin** that passes between casing sides in the locus of displacement of the common deadlocking slide to restrain the common deadlocking slide from being displaced upwardly from the second deadlocking configuration to a position enabling the first cam to depart the drive recess.

Where locking to the first locked configuration is required, the stop pin is omitted and the lock includes a slide spring and the deadlocking slide of the first locked configuration and second locked configuration in the same position. In these locks, the ball and spring are omitted to provide free movement to the deadlocking slide.

Deadlatching locks operable by cylinder

In other deadlatching locks having an advanced latch bolt, the unlatching levers are omitted as shown in Fig 15, and the latch bolt is displaced to the retracted position by actuation of the of the first cam and/or by actuation of the locking cam to cause the deadlocking slide to displace. In these locks, the **pin 167** of the foot of the deadlocking slide is within an aperture of a vertically elongated **link 260** to thereby connect the two members.The upper end of the link extends beyond while

overlapping a **connecting arm 262** of a modified **unlatching cam 263** that has a sideways protruding **pin 264** that extends into a vertically elongated **recess 265** within the link. The modified unlatching cam includes the **driving shoulder 266** that is engageable with the unlatching rocker as previously described and is otherwise the same as that described above. The lock is configured such that when a **deadlatching deadlocking slide 267** (being a deadlocking slide as the common deadlocking slide but including a leading end having a **ramped shoulder 268** that extends rearwardly while extending upwardly to provide clearance for the bolt to displace inwardly) is in the deadlocking configuration, the leading end is behind the engageable shoulder of the bolt. During displacement of the said slide from the deadlocking position, the first part of the displacement is devoted to removing the engaging shoulder from behind the engageable shoulder [to enable the bolt to be inwardly displaced] during which displacement the pin slides relatively within the recess 265. During the second part of the displacement, the pin abuts the upper end of the recess to be acted on by the link whereby to be displaced downwardly whereby to displace the modified unlatching cam to displace the unlatching rocker to cause the bolt to be inwardly displaced. The lock is configured such that the deadlatching deadlocking slide is in the undisplaced configuration when the bolt is fully retracted. In the pre-latching configuration, the bolt is restrained from outwardly displacing by the control rocker and the deadlatching deadlocking slide abuts the bolt to be restrained against displacement. During latching the auxiliary bolt is depressed to displace the control rocker from the bolt, the bolt is inwardly displaced and subsequently displaced to the fully extended position to as a consequence free the deadlatching deadlocking slide to enable it to be displaced by biasing means up behind the bolt.

In some deadlatching locks there is a locking lever while in others it is omitted. The lock includes a slide spring and the deadlocking slide of the first locked configuration and second locked configuration in the same position and the lock is lockable to the first locked configuration. In these locks, the ball and spring are omitted to provide free movement to the deadlocking slide.

Locks where the remote locks are operable by cylinder

In some locks as shown in Fig 16, each drive arm and the driver locking slide are omitted and the driver annulus is operably connected to the deadlocking slide by a vertically elongated **deadlocking slide extension 270** that preferably comprises a rod that extends along the rear of the lock and that has a return portion at each end, one of which shares an **alternative first pin joint 271** with the driver annulus and the other shares a pin joint with the foot portion of the deadlocking slide. In this form of

lock, the deadlocking slide is preferably configured to displace about 11 MM as is common in security door locks. However, if the axis of the alternative pin joint is a lesser radial distance from the axis of the annulus than the first pin joint and they are co-radial then a displacement by the deadlocking slide causes a larger displacement of the drive slides sharing first and second pin joints. By this means the vertically elongated drive members can be displaced15 MM by operation of the cylinder. In these forms of locks, the remote bolts are operated by actuation of the key and/or locking lever as is common in security door locks. The locks are configured such that the undisplaced configuration of the deadlocking slide corresponds to the undisplaced configuration of the driver annulus. In these locks the drive members are connected to the driver annulus as described elsewhere herein.

Lock for the subsidiary door of double French Doors

In some locks as shown in Fig 17, the latch bolt, auxiliary bolt and locking cam are omitted to provide a lock for the subsidiary door (that which has the strike plate attached) of a pair of French doors, said lock having one or a pair of remote engaging members operated by an unlatching lever as described above. In other locks, the lock body is adapted to include a **recess 280** for an outwardly biased **locking plunger 281** that is positioned adjacent the driver member that when depressed engages in a **peripheral recess 282** of the driver annulus to restrain it from being displaced from the fully displaced position corresponding to extended remote bolts. This locking plunger is depressed when the other door is closed wherein the front plate of the lock of this door slides over the locking plunger to depress it to engage in the peripheral recess – by this means the subsidiary door is locked by the closing of the first door that preferably employs a lock with a latch bolt as described above.

Conventional passage lock where the latch bolt operated by lever from either side at all times.

This lock has an outwardly biased latch bolt – advanced or other, at least one unlatching cam, an unlatching rocker, interior and exterior levers connected by a single shaft to the unlatching cam, no cylinder nor locking member and the deadlocking slide and locking cam may electively be included. This lock may electively be configured to operate remote locks.

Conventional privacy lock having a latch bolt operated by lever from either side except when levers are locked by locking lever (snib) on inside.

This lock is based on the egress lock and has a lockable exterior lever and a locking lever connected to the exterior handle set by a spindle that passes through the lock body; it only has a single unlatching cam, a single rod and the cylinder,

deadlocking slide and locking cam are omitted and the exterior handle set includes an exterior locking lever comprising hand operable coin slot that is connected to the locking cam by an extension to the spindle. Once locked by locking lever, the lock must be unlocked by locking lever to enable unlatching. The lock may be configured to operate remote locks.

Conventional patio lock where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by locking lever on inside. Automatic unlocking when inside lever is rotated or unlocked by locking lever.

This lock is based on the egress lock having a lockable exterior lever, an egress deadlocking slide, a locking lever and egress locking cam, and levers connected by separate shafts to separate unlatching cams. The cylinder is omitted and the stop pin is included. The lock may be configured to operate remote locks.

Conventional entrance lock where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by locking lever or cylinder. This lock is based on the egress lock but there is no locking cam and the spindle passes through an aperture in the casing to mesh in lever locking cam of the exterior handle assembly and the lock includes a stop pin to prevent the lock from being locked to the first locked configuration.

When the exterior lever is locked, the exterior lever may be operated after unlocking by key or locking lever. The lock may be configured to operate remote locks.

Conventional entrance lock where the deadlocking latch bolt is operated by lever from either side except when the outside lever is locked by locking lever on inside. When the outside lever is locked, the exterior lever may be operated after unlocking by key or by rotating interior lever which unlocks the exterior lever or by operating locking lever. The lock includes a stop pin to prevent the lock from being locked to the first locked configuration.

This lock is an egress lock as described above. The lock described may be configured to operate remote locks.

Conventional classroom where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by key from exterior. When the outside lever is locked, the latch bolt is retracted by rotating the interior lever or by unlocking the exterior lever by key and then operating exterior lever.

This lock is based on the egress lock but there is no locking cam and the spindle passes through an aperture in the casing to mesh in lever locking cam of the exterior handle assembly and there is a stop pin to prevent the lock being locked to the first locked configuration. When the exterior lever is locked, the exterior lever may

be operated after unlocking by key or locking lever. The lock may be configured to operate remote locks.

Conventional F91 lock where the deadlocking latch bolt operated by lever from either side except when both levers are locked by key from either side.

This lock is as the standard lock described above. The lock electively includes a locking member. The lock may be configured to operate remote locks.

ALTERNATIVE FUNCTIONALITY and INTEGERS & OPTIONAL FORMS

Bolt

'a) The advanced latch bolt first portion comprises a substantially **prism-like solid 300** as shown in Fig 18, and/or b) to f) below

'b) The advanced latch bolt first portion comprises a substantially prism-like solid as shown in Fig 19, that is adapted to be slightly angled inwardly on both sides to assist the bolt enter the aperture in the catch plate or strike plate; **each side 301** commencing at a position disposed towards the front plate (of the fully extended bolt) slopes inwardly towards the leading end to (over the length of the bolt) reduce the bolt width on each side by length **["wr"]** – this angling of each sides being different from that described below that addresses inwards displacement of the latch bolt during latching. These bolts preferably include at least one a full width **bridge portion 302** within the generally angled sides described above, said bridge being defined in-part by two parallel horizontal planes. The bolt (with at least one bridge) is employed with a ramping strike/catch plate described below.

'c) The advanced latch bolt **leading end 303** is profiled on both sides as shown in Fig 2 (to accommodate both left hand and right hand hinged doors) to facilitate latching wherein the leading portion is chamfered and/or curved, or otherwise profiled on each side to assist latching wherein the latch bolt is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching, said profiling in some forms comprising a simple radius on the edge defining the junction between the side of the bolt and the outer end of the bolt, and/or d) to f) below

'd) The advanced latch bolt in the fully extended position is extended so far that it could not latch with the strike plate unless it were restrained in the pre-latching configuration, and/or e) to f) below

'e) The advanced latch bolt comprises a substantially prism-like solid having a **slot 310** as shown in 23, in which is supported at least one and preferably a pair of counter-acting pivotally displaceable hooking arms that are displaced from the bolt as the bolt displaces to the fully extended position. In some forms of this bolt, there is a **horizontal slot 311** extending from one side to the other and each **hooking arms 312** is supported to be displaceable from a side of the bolt. Each hooking arm

terminates at the inner end with a sideways protruding **control shoulder 313** and at the other, outer end in a **hook 314** that is displaceable from within the bolt to protrude from the side of the bolt, to engage behind the **aperture edge 315** within a **catch plate 316** or **strike plate 317** as whereby to become longitudinally engaged. Each arms is supported by a vertical **pin 318** that has passage through an aperture in each arm, said pin defining the vertical pivotal axis of each arm. The hooked arm is configured such that as the bolt displaces towards the fully extended position, each control shoulder is brought into contact with the **inside face 319** of the front plate and as the bolt further extends, the arm is forced inwardly by the front plate aperture edge to displace each hook outwardly – the **front plate aperture edge 320** exerting a moment on each arm to cause it to displace. When the bolt is displaced towards the retracted position from the fully extended and engaged configuration, the strike plate or catch plate aperture edge acts on the hooks (or ramped surface) to displace the hooks into the bolt envelope where they are retained by the front plate aperture edge – the hooked arm being so restrained when the bolt is in the pre-latching configuration and until the hooks have entered the strike plate or catch plate aperture during latching. In other forms, each hook is replaced by a **ramped shoulder 321.**The above-described bolt is suitable for use in locks for both hinged doors when used with a strike plate and sliding doors when used with catch plate. The width **w1**, of the bolt first portion is preferably of reduced width to be less than the width of the bolt return portion **w2** so that the bolt with outwardly displaced control shoulders can displace within the sides of the casing, and/or f) below

'f) The **corners 330** of the bolt aperture are radiused to provide increased front plate strength and the upper and lower **edges 331** of the bolt are configured to conform to the aperture profile with working clearances.

Bolt - Other

'a) The bolt comprises a latch bolt having a first portion substantially comprises half a solid prism having a **bevel 332** on one side as shown in Fig 20, that extends from top to bottom and from the **leading end 332** of the bolt as is common in bevelled latch bolts and the latch either has or does not require a pre-latching configuration and accordingly either is or is not accompanied by an auxiliary bolt, or

'b) The bolt comprises a hand **actuatable bolt 333**, the driver annulus includes the secondary drive shoulder and the unlatching rocker includes the secondary driven shoulder. This bolt comprises a latch bolt as described above and in other forms the lock comprises a latch bolt as described but without the bolt biasing means.

'c) The bolt spring compression spring (supported between the bolt and rear inside casing wall) acts directly on the second arm of the rocker to outwardly bias the latch bolt by outwardly biasing the second rocker arm. In some locks (not including egress locks), the lock may employ either the compression spring described above or a torsion spring similar to that described above, that acts directly on the bolt. To minimize the components types within the lock series it is preferable that all locks employ the torsion spring that acts on the unlatching rocker.

Cylinders

'a) In some locks the **first cam 350** having the radially protruding **first cam arm 351,** is supported within the casing by the casing sides as described in [Watts AU 696343] to be operable by a barrel supported within a handle assembly, herein being included by reference.

'b) In some standard locks, the cylinder comprises a clutched cam cylinder, the first cam is operated by being rotated 360 degrees. In locks employing such cylinders, the lock does not include the locking lever, locking cam and the first cam is given space to fully rotate. In this case during locking, the first cam leaves the drive recess, passes over the exit face and comes to rest in the initial undisplaced position enabling key removal. In this case, there is a spring-loaded ball that is engageable in recesses corresponding to an undisplaced slide and a slide in the first locked configuration.

'c) In some locks, the cylinder comprises a single free rotation cylinder

'd) In some locks, the cylinder comprises a **free-rotation-double-cylinder 352**

'e) In some locks, the cylinder comprises a free-rotation-cylinder that is connected on one side to a hand operable member on one side that comprises an operable knob.

'f) In some standard, egress and deadlatching locks, there is an exterior locking lever, as described in [Watts AU 18474/2000] that hereby included by reference, that is operable to displace the lock into the second or third locked mode but which is not operable to displace the lock from the second locked mode.

Auxiliary bolt

'a) The first auxiliary bolt first portion comprises a prism-like member as shown in Fig 2, having a leading end 340 profiled on both sides to accommodate both left hand and right hand doors wherein the profiled portion on each side is curved, chamfer or otherwise profiled to facilitate latching wherein the auxiliary bolt is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching.

Strike/catch plate

In some locks, the strike plate comprises an improved **strike plate 400** as shown in Fig 25 that comprises a substantially conventional strike plate having a **wing 401** to facilitate latching, an **aperture 402** to provide passage for the bolt and upper and lower portions that are attachable (usually by screws) to the element defining the opening, said aperture may extend to one or more clearance apertures.

The aperture of the improved strike plate includes a **front edge 403** against which the bolt is urged when the door is urged in an opening direction as occurs when one attempts to force open a locked door. The substantially conventional strike plate in preferred forms, is modified to resist jemmying by enabling the portion of the strike plate adjacent the front edge to be displaced with the bolt while the portions attached to the opening remain attached to the opening while being subjected to forces that tend to pull the strike plate away from the opening and that urge the fixing screws to pull out, however the further modified strike plate subjects the screws to considerably lower forces than are applied by a conventional strike plate. The aperture of this strike plate are within a substantially flat **plate-like portion 404** extending from between a **lower slot 405** to an **upper slot 406** and connected to the strike plate **wing 407** that preferably comprises an angled or curved wing and each said slot extends from the **rear edge 408** to pass between the screw aperture and aperture and preferably each slot further extends to include a **vertical portion 409** between the screw aperture and wing. Importantly, the front edge of the aperture is within a portion of the strike plate that is connected to the wing so as to be displaced with the wing.

The strike plate wing is connected by **bridges 410** of reduced cross-sectional area and the strike plate is of a deformable material enabling these bridges to deform without cracking and the reduced areas enables deformation to occur at reduced forces – these characteristics enabling the wing to be angularly displaced about a **deformation axis 412** that passes substantially through each bridge. If forms where the front edge is rearwardly disposed relative to this deformation axis, rotation of the wing causes the front edge to be displaced towards the wing and bolt to bring the bolt into closer engagement with the strike plate. When a jemmy blade rests on the strike plate wing as it is rotated to part the wing from the opening, the blade angularly displaces to deform the bridges and to cause the wing to rotate about the deformation axis.

The **upper and lower extremes 413** of the plate-like portion (that portion between the apertures and the slots) are of reduced cross-sectional area to enable these portions to deform under low forces so as to deform as the blade portion

angularly displaces about the deformation axis. When these portions are caused to engage the face of the lock they deform so as not to inhibit the displacement of the wing about the deformation axis.

The bridges connect to **fixable portions 414** that include **screw apertures 415** through which screws shanks have passage and by which the fixable portion is attached to the opening. In some types of deformation the fixable portions angularly displace about the screw to reduce the effective distance between bridges, and this feature combined with the fact that the wing is attached only at each to a bridge enables the wing and front edge to deform like a bow and at comparatively moderately low forces to thereby enable the front edge to displace with the bolt while the fixable portions remain attached to the opening while being subjected to reduced loads that urge the screws to pull out of the opening.

In common forms of jemmy attack, when a closed and locked door is urged open under the action of a jemmy blade placed adjacent the bolt, the bolt is forced against the front edge while the lock is simultaneously displaced away from the strike plate and as a result, the bolt (in part, as a result of friction between the bolt and front edge) causes the strike plate to deform to enable the front edge to displace with it.

In some locks, the strike/catch plate includes a substantially rectangular aperture as elsewhere described having a width substantially the same as the bolt (plus operating clearance) but further including an additional **clearance aperture 390** shown in Fig 25 extending exteriorly from the aperture and in a position adjacent each bridge described in Bolt b) above. The clearance apertures extend horizontally for a distance not less wr defined above and for a vertical height not less than the height of the bridge plus the vertical clearance between the aperture and general bolt. This configuration enables the bolt of a lock in a partly open wing to latch whereby to enter the aperture when a hinged wing is partly open. This functionality pre-disposes a bolt to be driven outwardly by deadlocking slide displacement and/or by actuation of the driver annulus as described above. These forms of integers find application in wings that must be closed against a seal and that require a force to be applied to fully close the wing. In usage the wing would be closed by hydraulic closer or by hand to cause the bolt to latch and the unlatching lever would then be lifted to actuate the bolt and drive remote engaging members to the operative position.

Alternative deadlatching lock

In this lock, the alternative auxiliary bolt is outwardly biased by a torsion spring supported about a sideways protruding pin being an extension of a casing fixed portion and the spring has a spring arm that lies behind the sideways protruding pin of the auxiliary bolt to outwardly bias the auxiliary bolt while leading to a moment

on the said bolt when it is inwardly retained by a strike plate, and the return portion, has a sideways protruding shoulder preferably comprising a cylindrical **pin** that engages within an aperture of an adjacent **control slide** that is located within the casing adjacent a sidewall to be vertically rectilinearly displaceable. The control slide aperture includes an upwardly **ramped slot** having a lower **ramped edge** that lies in the same vertical plane as the pin. The parts are configured such that as the auxiliary bolt is inwardly displaced the pin along the ramped shoulder to urge the control slide away from the bolt to displace a **control shoulder** of the control slide away from the bolt to enable it to be displaced to the fully extended position by biasing means. The control slide at the leading end has the control shoulder that is engageable in a **edge recess** in the under-edge of the bolt that comprises a horizontally elongated slot extending from a substantially **vertical slot end** towards the outer end of the bolt – preferably the slot does not extend sideways to the surface of the bolt. The ramped slot is also defined in-part by a upper **ramped edge** that lies in the same vertical plane as the pin. The parts are configured such that as the auxiliary bolt is outwardly displaced the pin slides along the upper ramped shoulder to urge the control slide towards the bolt to displace the control shoulder of the control slide towards engagement with the bolt. The aperture in the control slide includes a substantially **horizontal elongation** to accommodate additional displacement of the auxiliary bolt. In normal usage, the bolt is fully retracted by unlatching lever operation and the wing is opened whereby to enable the auxiliary bolt to outwardly displace till it is restrained by the control slide itself restrained by abutting the bolt. As the unlatching lever is then reversed towards the undisplaced position, the bolt outwardly displaces during which displacement the control shoulder is displaced by the auxiliary bolt into the under-edge recess to restrain the bolt in the pre-latching configuration.

In this lock, the common is biased by compression **spring** towards the third locked configuration slide by a spring within a vertically elongated **spring recess**. This deadlocking locking slide has a horizontally elongated **ramped shoulder** projecting towards the alternative auxiliary bolt that includes a horizontal **engageable face.**

The alternative auxiliary bolt has a rearwardly projecting **blade portion** that passes beside the alternative deadlocking slide and that has a horizontally elongated **ramped shoulder** projecting towards the deadlocking slide with a horizontal **engageable face** projecting towards the alternative deadlocking slide. The blade is biased and displaceable towards the alternative locking slide as a result of the auxiliary bolt being restrained against outward displacement by contact with the strike plate while a side of the alternative auxiliary bolt is urged by the spring arm – this

arrangement giving rise to a moment that causes the auxiliary bolt to be urged towards the alternative deadlocking slide – because the spring arm is on the opposite side of the auxiliary bolt from the blade portion

The lock is configured such that in the pre-latching configuration, the engageable face of the alternative locking slide is above the engageable face of the alternative auxiliary bolt and the alternative locking slide abuts the bolt to be restrained by the bolt. When the wing is closed the bolt is displaced to the fully extended position and the alternative deadlocking slide is displaced to the second locking configuration while the alternative auxiliary bolt is retained depressed. In this locked configuration the alternative locking slide lies behind the bolt to deadlock the bolt such that it cannot be retracted by lever operation and the alternative auxiliary bolt is depressed.

When in the second locked configuration, either the (cylinder - if included) or (locking lever - if included) can be operated to displace the alternative deadlocking slide to the undisplaced position during which displacement the ramped engageable horizontal face of the deadlocking slide passes over the ramped engageable horizontal face of the alternative auxiliary bolt by displacing the blade of the alternative auxiliary bolt sideways, after which the blade portion of the auxiliary bolt displaces towards the alternative locking slide to engage the said slide and retain it until such time as the alternative auxiliary bolt is depressed. When the auxiliary bolt displaces to the fully extended position as occurs when the wing is opened, the ramped engageable horizontal face of the auxiliary bolt displaces outwardly from above the ramped engageable horizontal face of the alternative locking slide to thereby release the slide to assume the position corresponding to the pre-latching configuration where the alternative deadlocking slide abuts the bolt

Claims Defining the Invention Are:

Standard

'1 A lock including a casing, an outwardly biased latch bolt supported in the casing to be displaceable between a fully extended position where the bolt protrudes from the casing and a retracted position in which it is substantially within the casing,

and operating means by which to displace the bolt towards the retracted position including at least one angularly displaceable unlatching cam operably connected to the bolt by an angularly displaceable unlatching rocker having a first arm operably associated with the unlatching cam and a second arm operably associated with the bolt, the unlatching cam being actuateable to cause the bolt to displace towards the retracted position.

'2 A lock according to Claim 1, including at least one unlatching lever connected to the at the least one unlatching cam by a shaft, said unlatching cam being displaceable by the unlatching lever to cause an unlatching arm of the said cam to engage the first arm to displace the first arm to displace the second arm to displace the bolt towards the retracted position.

'3 A lock according to any one of the above claims, including a deadlocking slide, a cylinder and a locking member each operably connected to the common deadlocking slide, said deadlocking slide being displaceable to a deadlocking configuration in which it cooperates with the latch bolt to restrain the bolt from being displaced to the retracted position, said lock being characterised by a first locked configuration from which it cannot be unlocked by the locking member and a second locked configuration from which it can be unlocked by the locking member.

Other claims relating just to standard lock

Exterior handle locking

'10 A lock according to Claim 1, including an interior and an exterior unlatching lever each independently operably connected to the latch bolt by an independent unlatching cam and independent shaft,

an egress deadlocking slide, a cylinder and a locking member and locking cam each operably connected by a spindle to locking means within the exterior handle assembly and each operably connected to the egress deadlocking slide, said locking member being displaceable to simultaneously lock the exterior lever and displace the egress deadlocking slide to a deadlocking configuration in which the latch bolt and egress deadlocking slide cooperating to restrain the latch bolt from being displaced to the retracted position,

the interior lever being displaceable to displace the unlatching rocker to displace the egress deadlocking slide from the deadlocking configuration to displace the egress locking cam to displace the spindle to thereby unlock the exterior lever.

Other claims relating just to egress lock.

Deadlatching lock

'20 A lock according to Claim 1, including a common deadlocking slide biased towards the bolt and the bolt comprises an advanced bolt, a cylinder and a locking member each operably connected to the common deadlocking slide, said deadlocking slide being displaceable by biasing means to a deadlocking configuration in which it cooperates with the latch bolt to restrain the bolt from being displaced to the retracted position,

said common deadlocking slide being displaceable to the undisplaced position by the cylinder during which displacement the locking cam is actuated to an overlapping position in which it engageable by the common deadlocking slide to be restrain from being displaced towards the bolt, said locking cam subsequently being displaceable to release the common deadlocking slide to enable it to abut the bolt in preparation for latching and automatic deadlocking.

Claims related to just above

Lock – unlatchable by cylinder

'30 A lock according to Claim 1, including a deadlatching deadlocking slide, a cylinder and a locking member each operably connected to the deadlatching deadlocking slide and the bolt comprises an advanced bolt,

said deadlatching deadlocking slide being displaceable to a deadlocking configuration in which it cooperates with the latch bolt to restrain the bolt from being displaced to the retracted position,

operating means by which to displace the latch bolt to the retracted position including the unlatching cam that is adapted to include a rearwardly extending connecting arm having a sideways protruding pin that locates in a vertically elongated aperture of a link that is connected by pin joint to the foot of the deadlatching deadlocking slide,

the cylinder being operable to displace the deadlatching deadlocking slide from the deadlocking position and to displace the latch bolt towards the retracted position.

Claims related to just unlatchable by cylinder

Driver

'40 A lock according to any one of the above claims, including an angularly displaceable driver member operably connectable to at least one remote engaging

member and displaceable to and from a locking disposition, said locking disposition corresponding to the operative position of at least one remote engaging member.

'42 A lock according to Claim 40, including at least one hand operable unlatching lever having a free end disposed from its pivotal axis operably connected to the at least one unlatching cam, said driver being displaceable to a locking disposition by upwards displacement of the unlatching lever free end, said driver being displaceable from the locking disposition to an undisplaced disposition by downwards displacement of the free end.

'43 A lock according to Claim 41, wherein the retracted latch bolt corresponds with an undisplaced driver member.

'44 A lock according to Claim 40, wherein the pivotal axis of the diver and unlatching cam are closely disposed

'45 A lock according to Claim 40, wherein the diver comprises a substantially annular member.

'46 A lock according to Claim 40, wherein the bolt is outwardly displaceable by actuation of the driver annulus

Driver operable by cylinder

'50 A lock according to Claim 3, wherein the deadlocking slide is connected by a deadlocking slide extension to the driver by a rearwardly disposed pivotal joint similar to the first pivotal joint,

said deadlocking slide being displaceable by the cylinder to displace the driver whereby to displace each connected drive member towards and away from the casing.

General

'60 A lock according to any one of the above claims, wherein the bolt comprises a hand actuatable bolt; or a latch bolt having a first portion substantially comprising half a solid prism having a bevel on one side; or an advanced bolt comprising prism-like solid having a leading portion that is chamfered or otherwise profiled on each side to assist latching or a prism-like solid that is adapted to be slightly angled inwardly on both sides to assist the bolt enter the aperture in the catch plate or strike plate and preferably include at least one a full width bridge portion.

[redacted]

INDEPENDENT CLAIMS RELATING TO COMPLETE LOCKS

Exterior handle locking

A lock including interior and exterior handle assemblies and a mortice lock body including a casing, an outwardly biased latch bolt supported in the casing to be

displaceable between a fully extended position where the bolt protrudes from the casing and a retracted position in which it is substantially within the casing, and operating means by which to displace the bolt towards the retracted including interior and exterior unlatching levers each independently operably connected to the latch bolt,

a deadlocking slide, a cylinder and a locking member and locking cam each operably connected by a spindle to locking means within the exterior handle assembly and by which the exterior lever is restrained against displacement,

said locking member being displaceable to simultaneously lock the exterior lever and displace the deadlocking slide to a deadlocking configuration in which the latch bolt and deadlocking slide cooperating to restrain the latch bolt from being displaced to the retracted position,

said deadlocking slide being displaceable by the interior lever to displace the locking cam to displace the spindle to unlock the exterior lever.

Deadlatching lock

To do Xxxxxxxxxxxxxxxxxxxx

& some subsidiary claims

Lock – unlatchable by cylinder

To do Xxxxxxxxxxxxxxxxxxxx

& some subsidiary claims

Driver

To do Xxxxxxxxxxxxxxxxxxxx

& some subsidiary claims

Driver operable by cylinder

To do Xxxxxxxxxxxxxxxxxxxx

& some subsidiary claims

INDEPENDENT CLAIMS RELATING TO DIFFERENT COMPLETE LOCKS

Fixed door lock

A lock including a casing having a front plate, an angularly displaceable driver operablely connectable to an upper remote engaging member by an upper vertically elongated drive member and/or connectable to a lower remote engaging member by a lower vertically elongated drive member,

at least one hand operable angularly displaceable lever having a free end and at least one angularly displaceable unlatching cam to operably connect the driver to the at least one lever, each connected drive member being displaceable towards and away from the casing by displacement of the free end,

said lock further including a locking plunger that protrudes from the front to be displaceable to engage in a recess in the driver whereby to restrain the driver against displacement.

INDEPENDENT CLAIMS RELATING TO PARTS OF LOCKS

100 A lock for a hinged door having a bolt and strike engageable with each other to restrain a partly open wing

110 A lock for a hinged door having a **ramping latch bolt** having a first portion comprising a substantially prism-like solid that is adapted to be slightly angled inwards on both sides to assist latching, said bolt being applied with a ramping catch plate.

120 A lock wherein the front plate can be removed to enable the control rocker to be removed to be replaced by another that restrains the bolt and latch bolt in a different pre-latching configuration.

'130 A lock including a deadlocking slide having an adapted leading end that includes a ramped (or otherwise profiled) shoulder that extends inwardly while extending upwardly, said slide being configured such that as the deadlocking slide is displaced towards the deadlocking position, the ramp engages with the lower rear corner of the engageable shoulder of the bolt to urge and displace the bolt outwardly

'131 A lock according to Claim 130, the action taking place by dint of the ramp sliding over the corner to exert a force having an outwards component. In these locks the deadlocking configuration corresponds to a fully extended bolt as defined above. This type of deadlocking slide is particularly

'132 A lock, including a drive, wherein upwards displacement of an unlatching lever causes the bolt to be driven to the fully extended position

'140 externally threaded fitting 350 can receive and mate with an internally threaded end of the lower drive member; connected to a flexible elongated cord 368 that extends along the inside of the lower drive member to facilitate fitting

'141 A lock according to Claim 140, wherein the fitting comprises a cylindrical members connected to a disc-like portion of larger diameter that is slotted to receive the orthogonal (dog leg) portion of the drive slide to restrain the fitting against

rotation, said fitting having a longitudinally elongated aperture and a cone portion through which the lower end of the drive slide passes to be crimped to prevent the fitting from being removed.

'150 An hand operable lever for a lock displaceable in both angular directions and biased towards an undisplaced position, said handle having a cylindrical **shank portion supported** within a hollow cylindrical portion comprising an extension to the back plate, and a **cupped member** enveloping the cylindrical portion and shank within, said cupped member having an axial **aperture** providing passage to and mating with the **drive shaft** that also mates within an axial **drive recess** of the shank to thereby operably couple the cupped member and lever,

said cupped member including a first aperture disposed from the pivotal axis of the lever **and** disposed towards the lever arm that is occupied by a right-angled **return portion** of a vertically elongated extended **tension spring** connected at the upper end to a **pinned extension** of the underside of the back plate, said spring urging the cupped member and hence lever to rotate about its axis,

and a second aperture disposed from the pivotal axis of the lever **and** disposed from the lever arm that is occupied by a right-angled **return portion** of a vertically elongated substantially unextended much stronger **tension spring** connected at the upper end to a **pinned extension** of the underside of the back plate

said spring acting as a stop to restrain the cupped member against rotation from the undisplaced position of the cupped member by the softer spring.

'151 A lever according to Claim 50, wherein downward displacement of the lever causes the softer spring to stretch more (urging the cup towards the undisplaced disposition) while the stronger spring exerts no force being displaced upwardly substantially as a rigid member as the **U shaped end** slides behind the **outer head** of the pinned extension in a crank-like manner; and upwards displacement of the lever causes the harder spring to stretch and the softer spring to become less stretched with the overwhelming force of the stronger

152 A lever according to Claim 50, lever includes a substantially cylindrical **shank portion** that is supported within a hollow annular horizontally elongated **shell** comprising an extension to the back plate having an opening to the face of the back plate and terminating within the underside of the backplate in a circular **annular end,** said shank preferably has a sideways protruding **retention shoulder 183** and the face and shell of the backplate are longitudinally **slotted 184** to provide passage for

the retention shoulder – the slot and retention shoulder being configured such that in normal operation they are never aligned.

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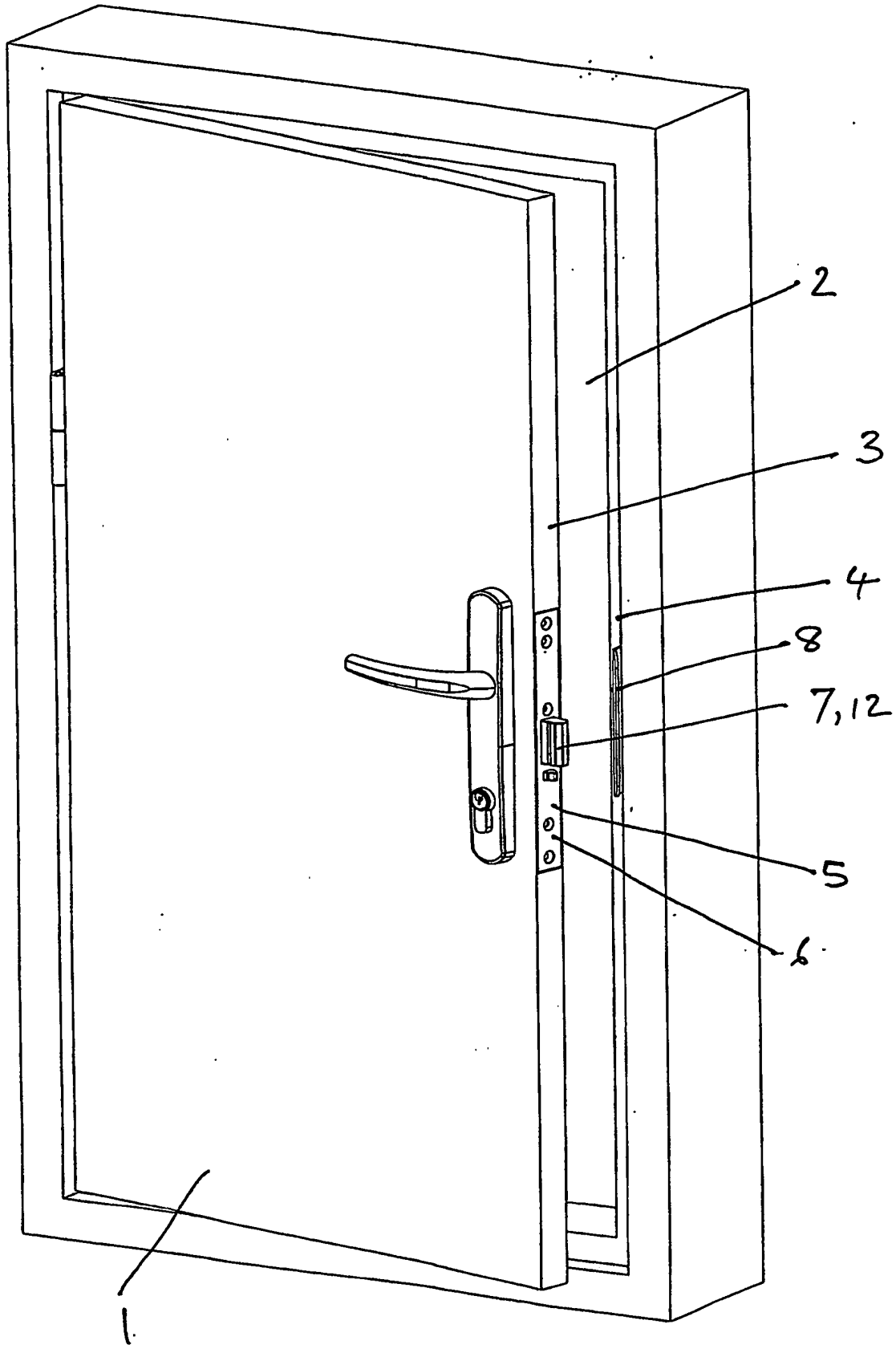

Fig 1

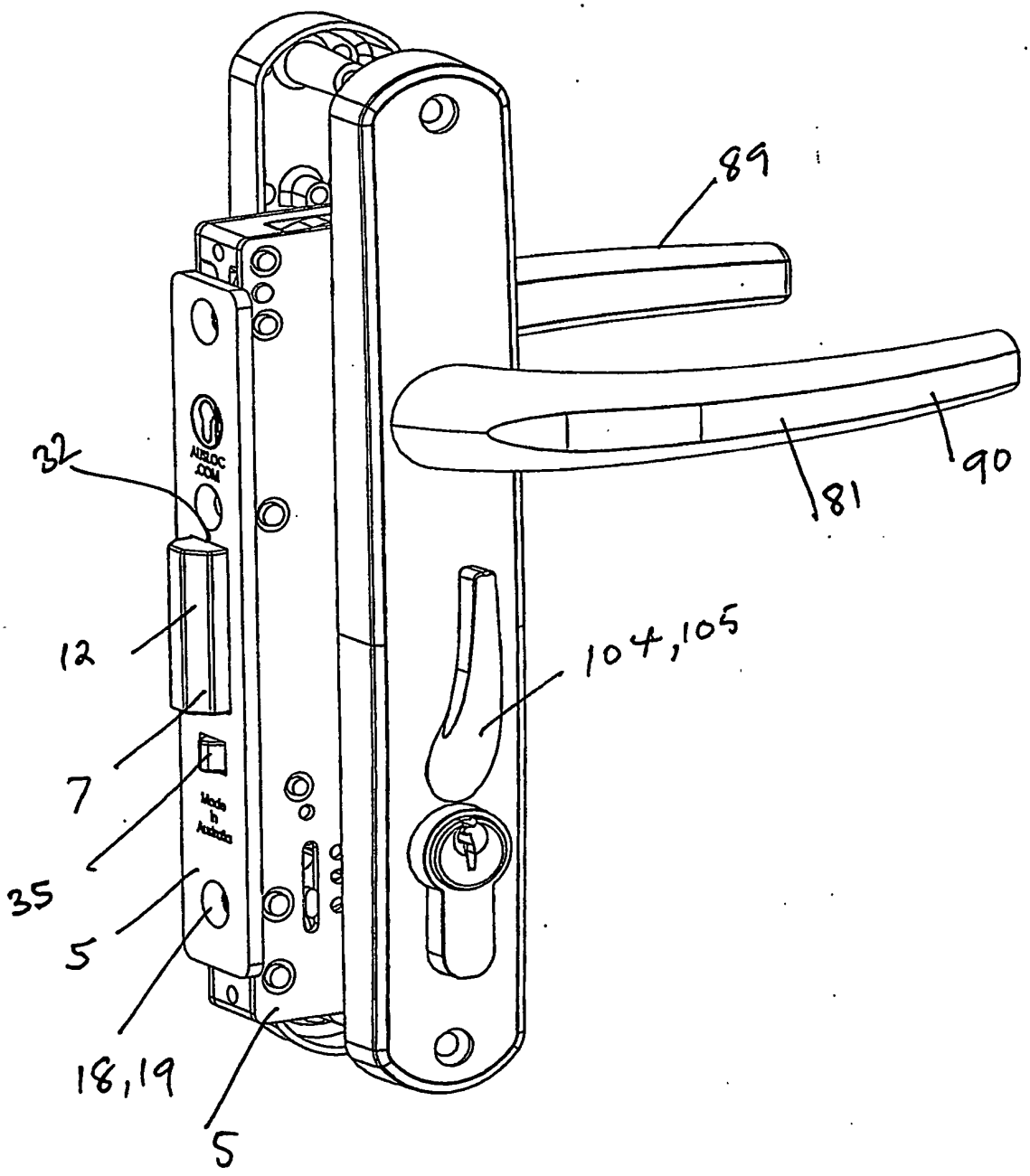

Fig 2

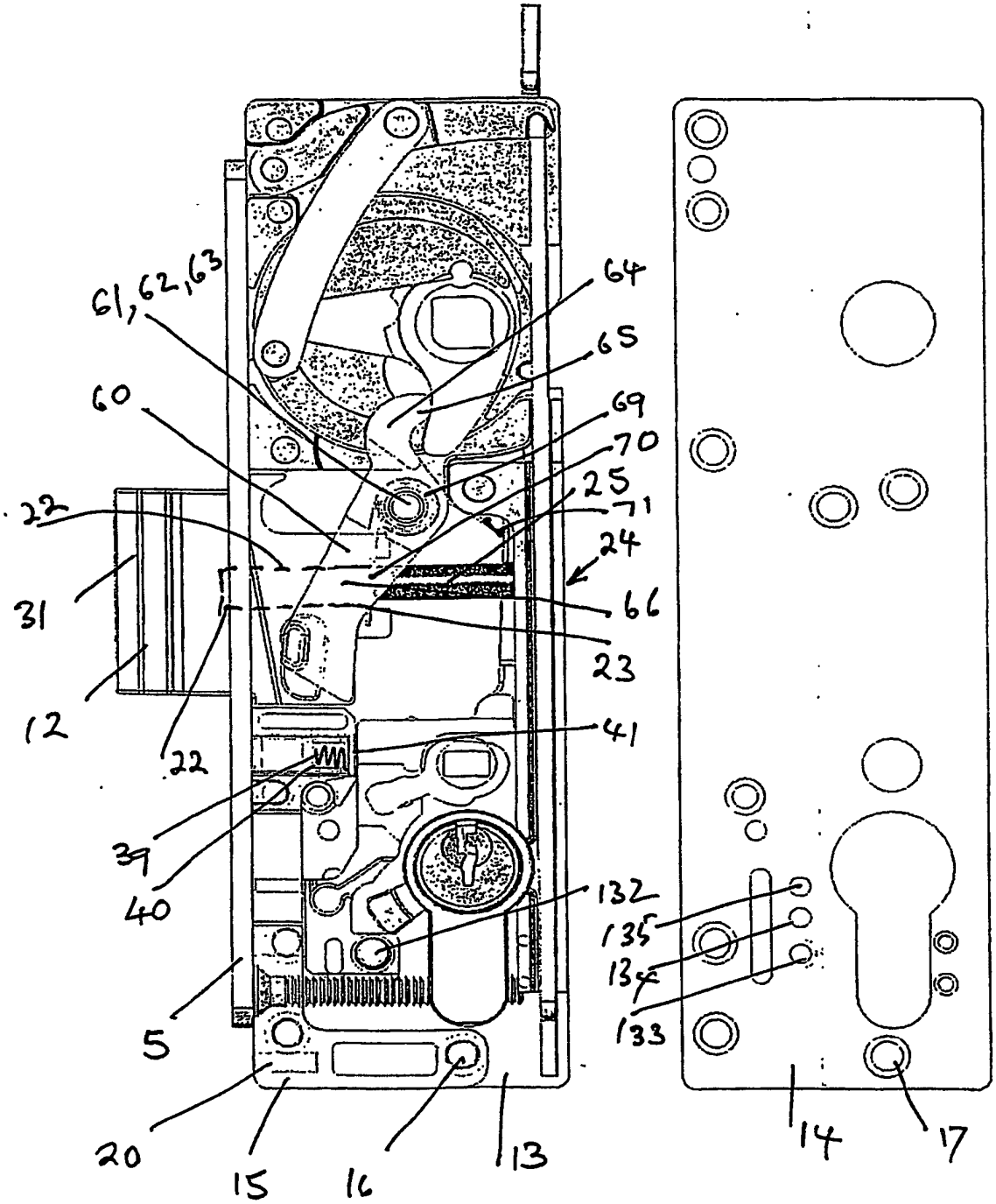
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Fig 3

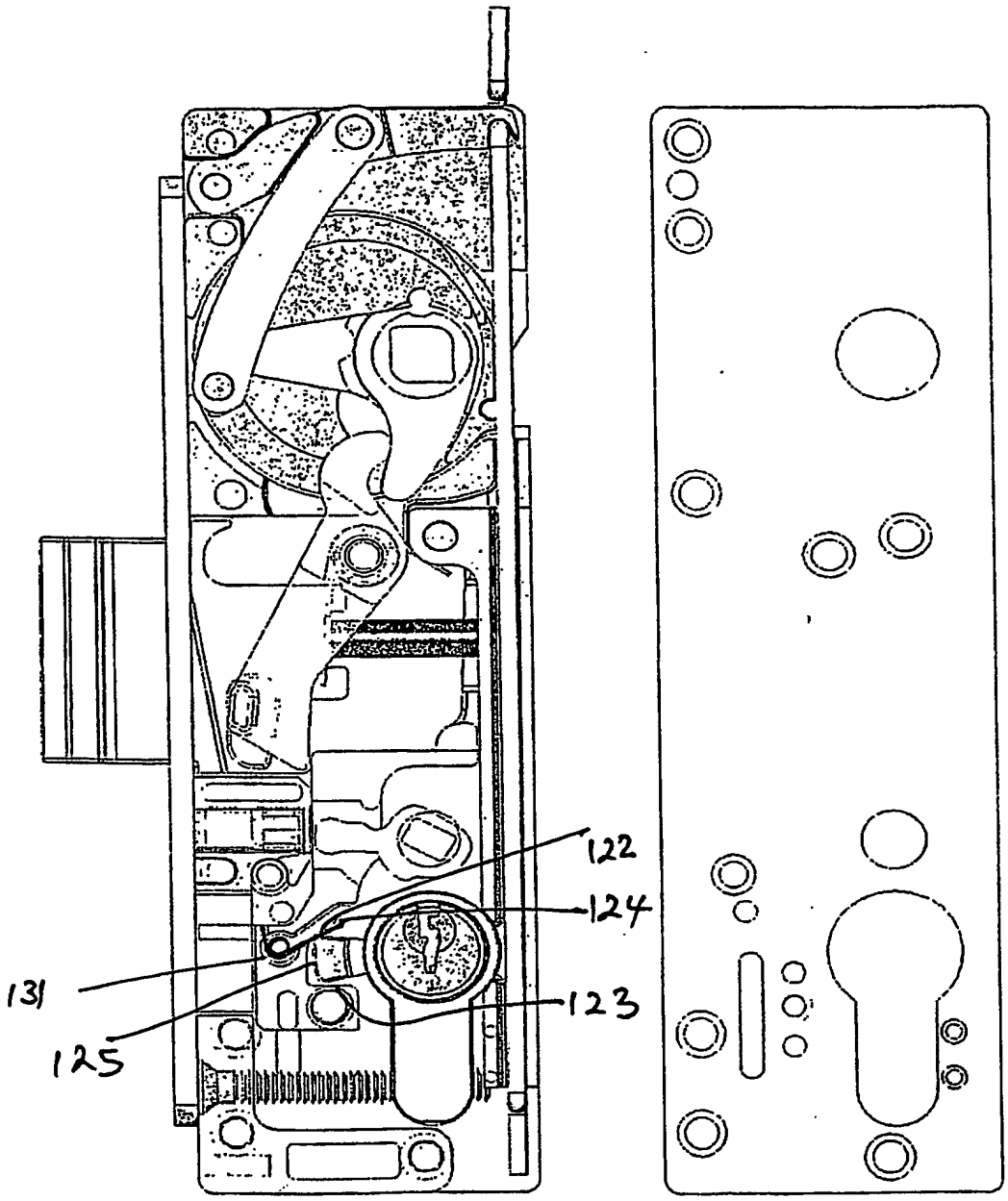

Fig 4

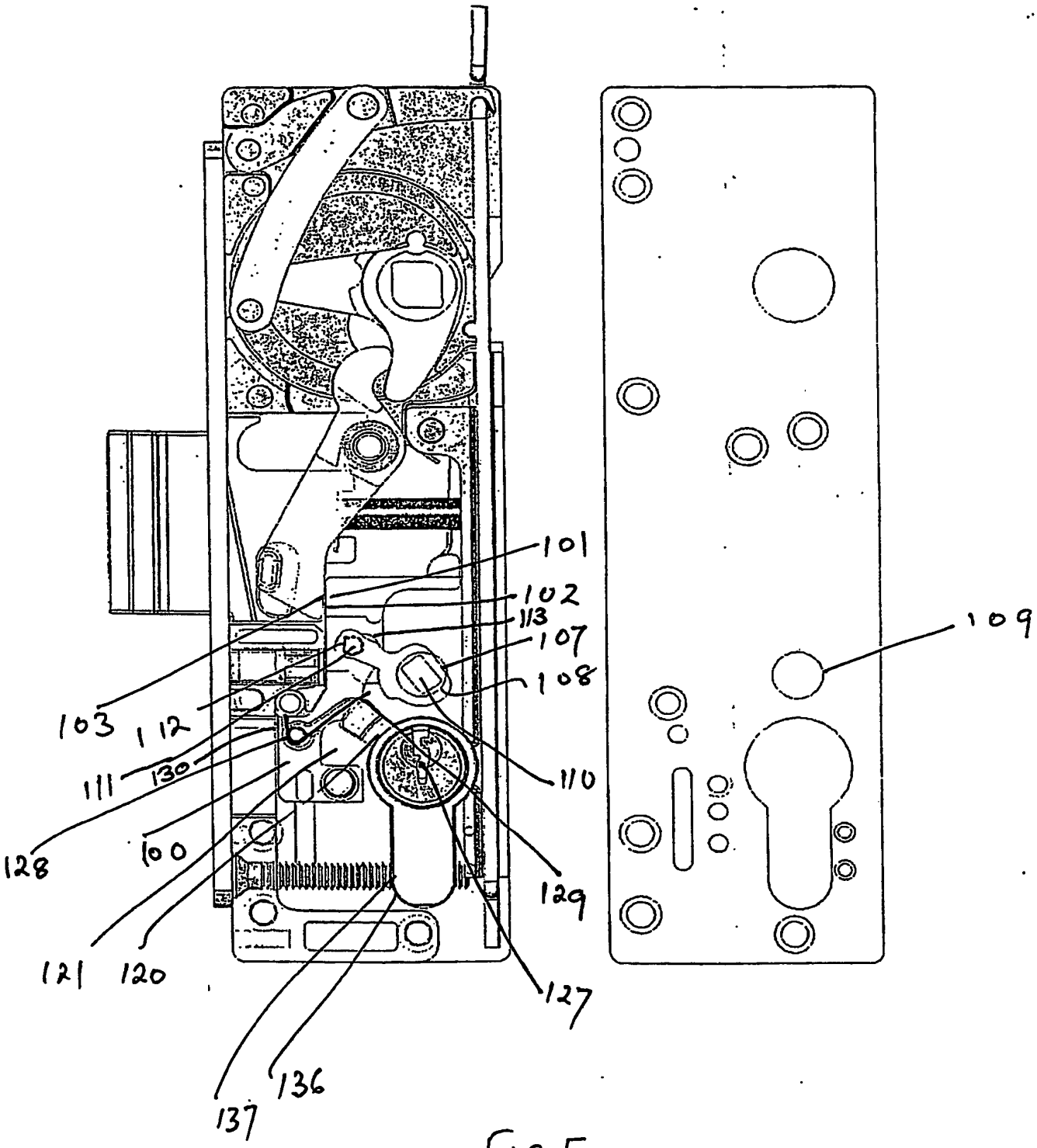
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Fig 5

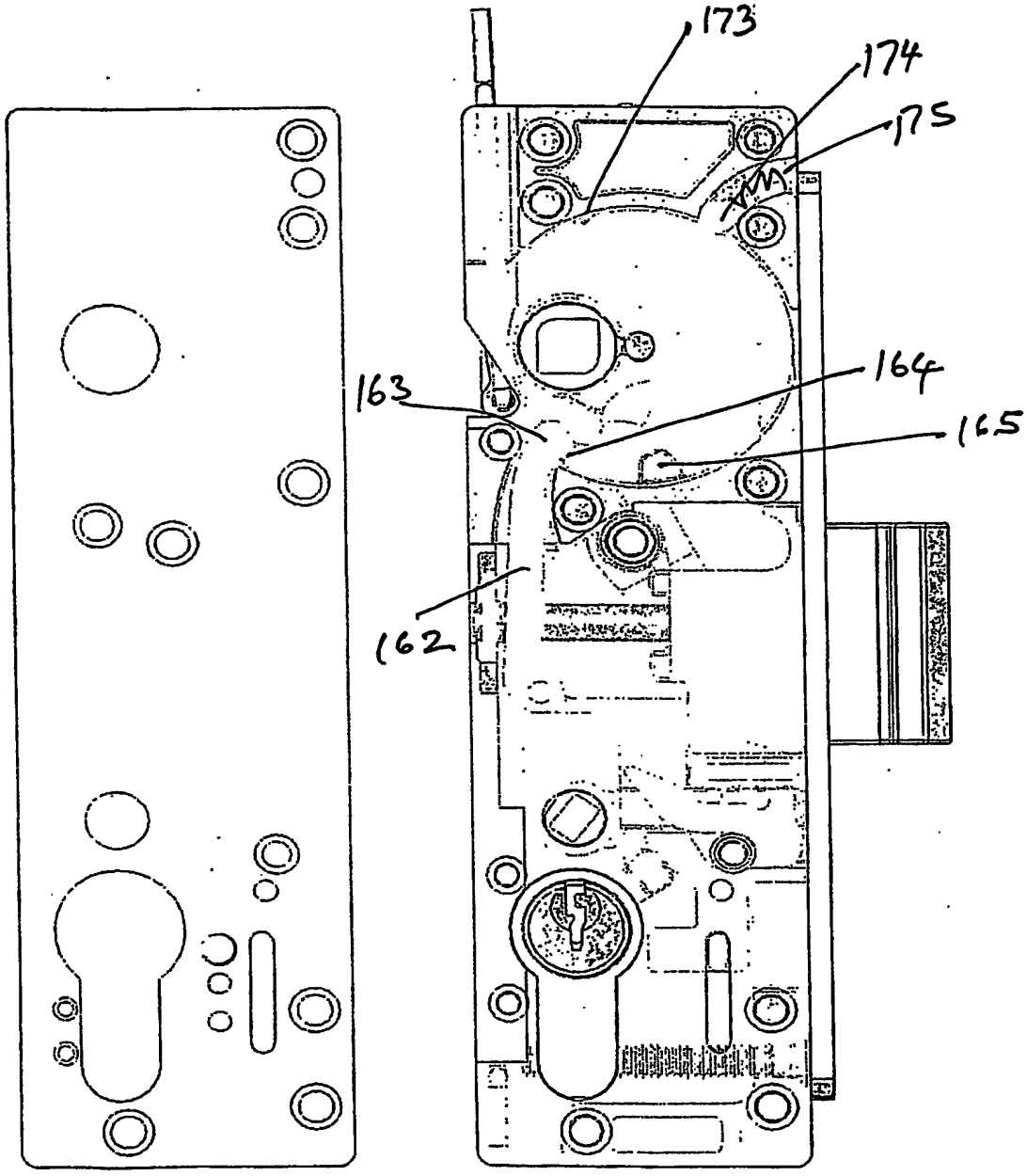


Fig 6

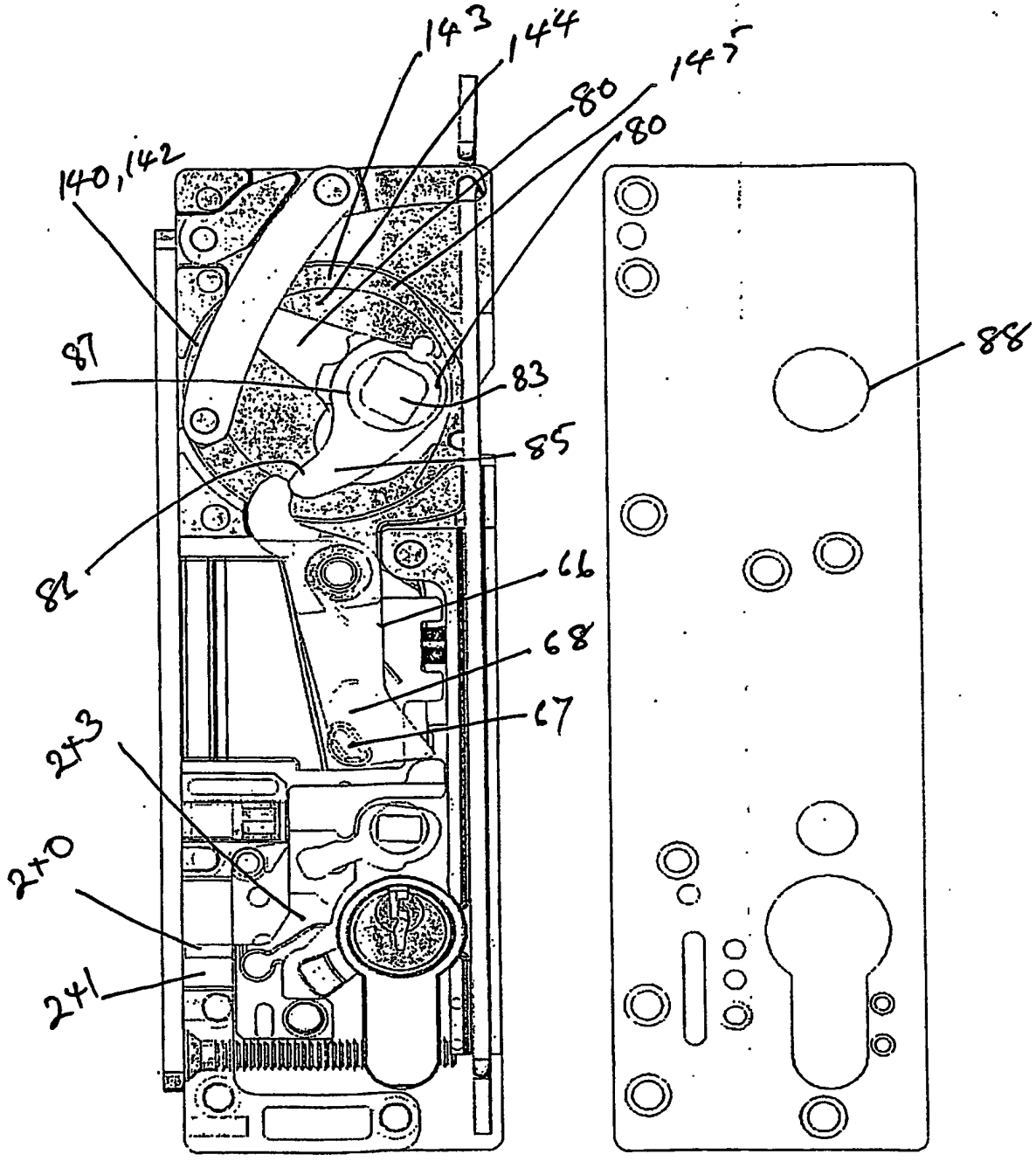


Fig7

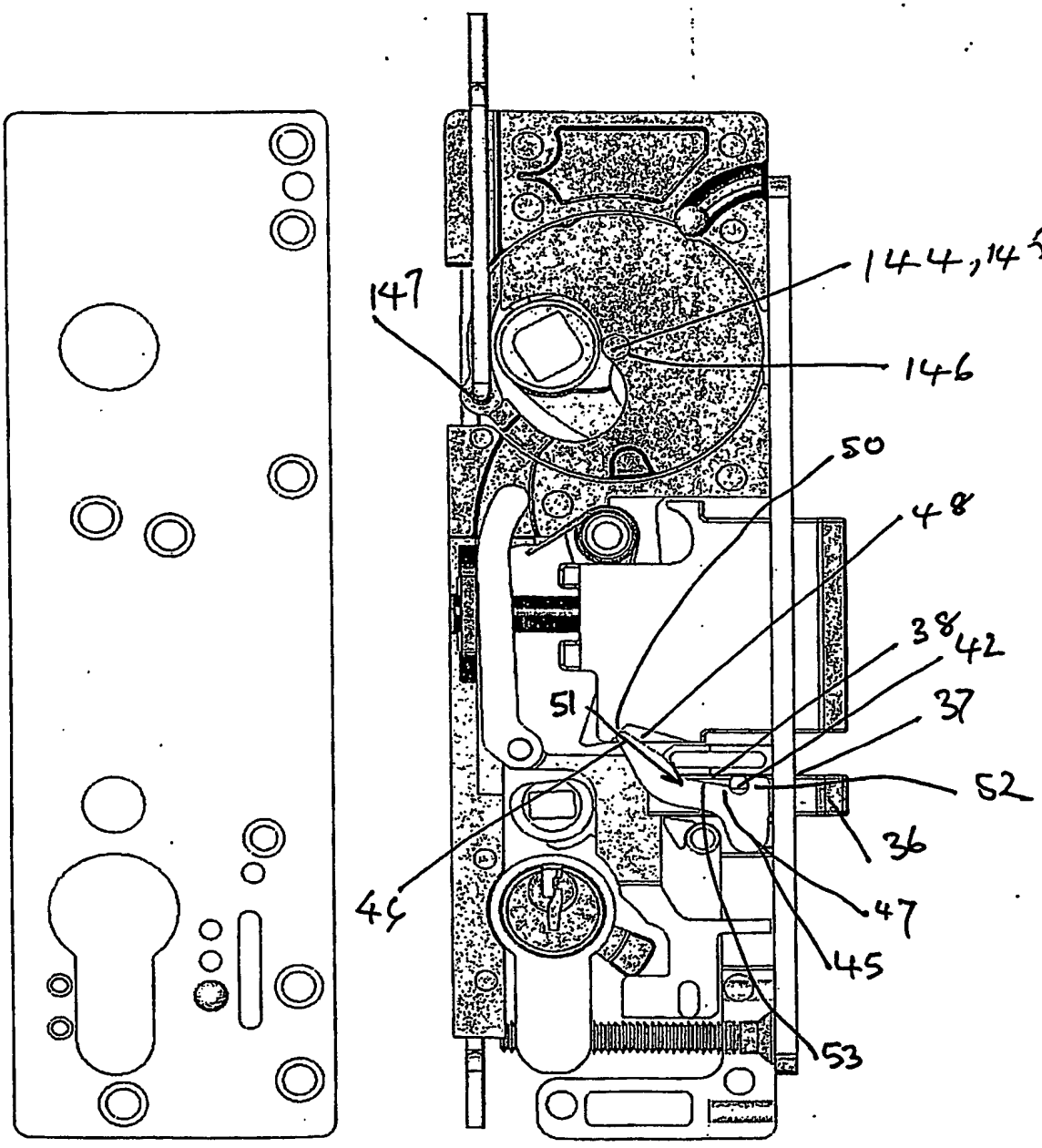


Fig 8

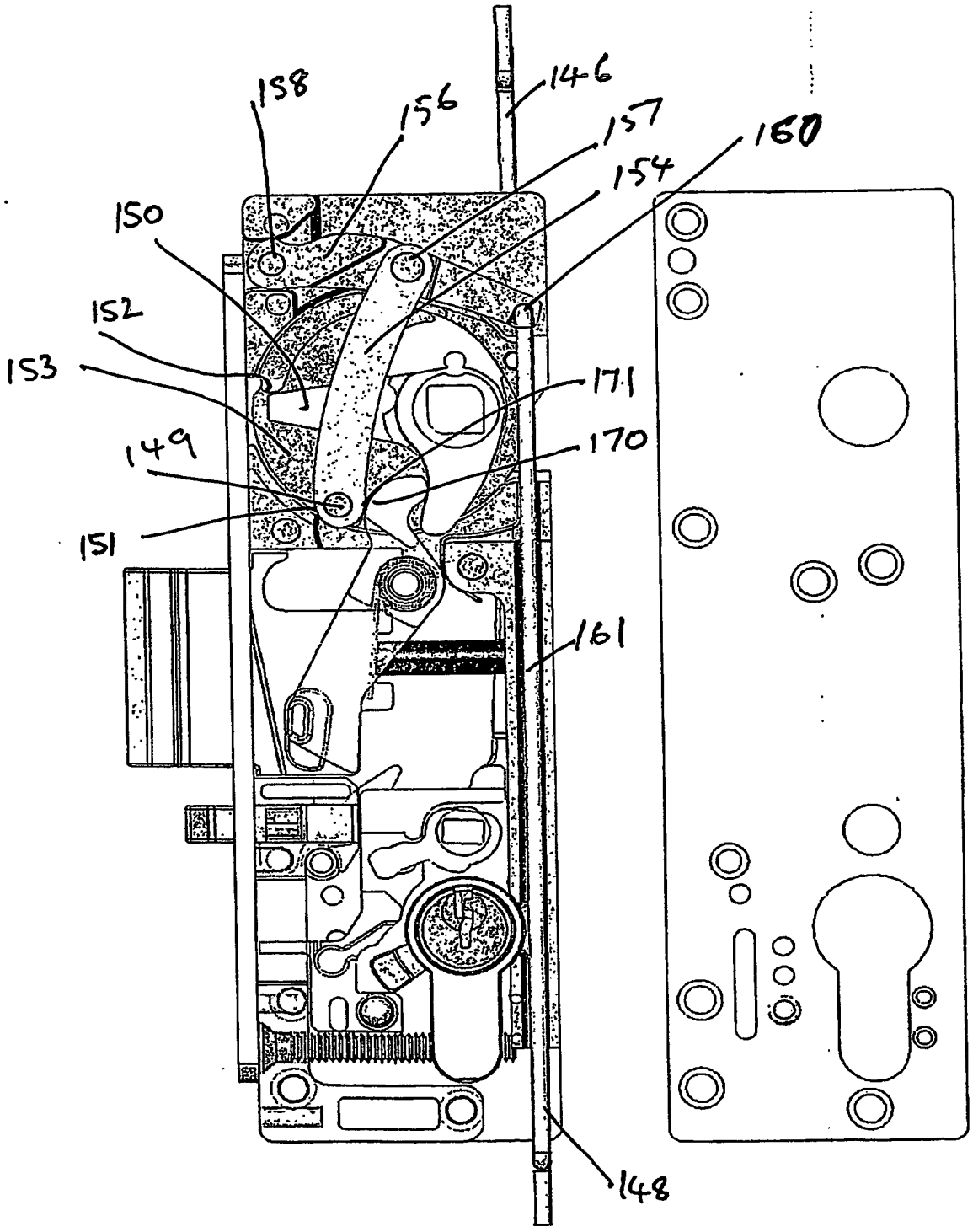


Fig 9

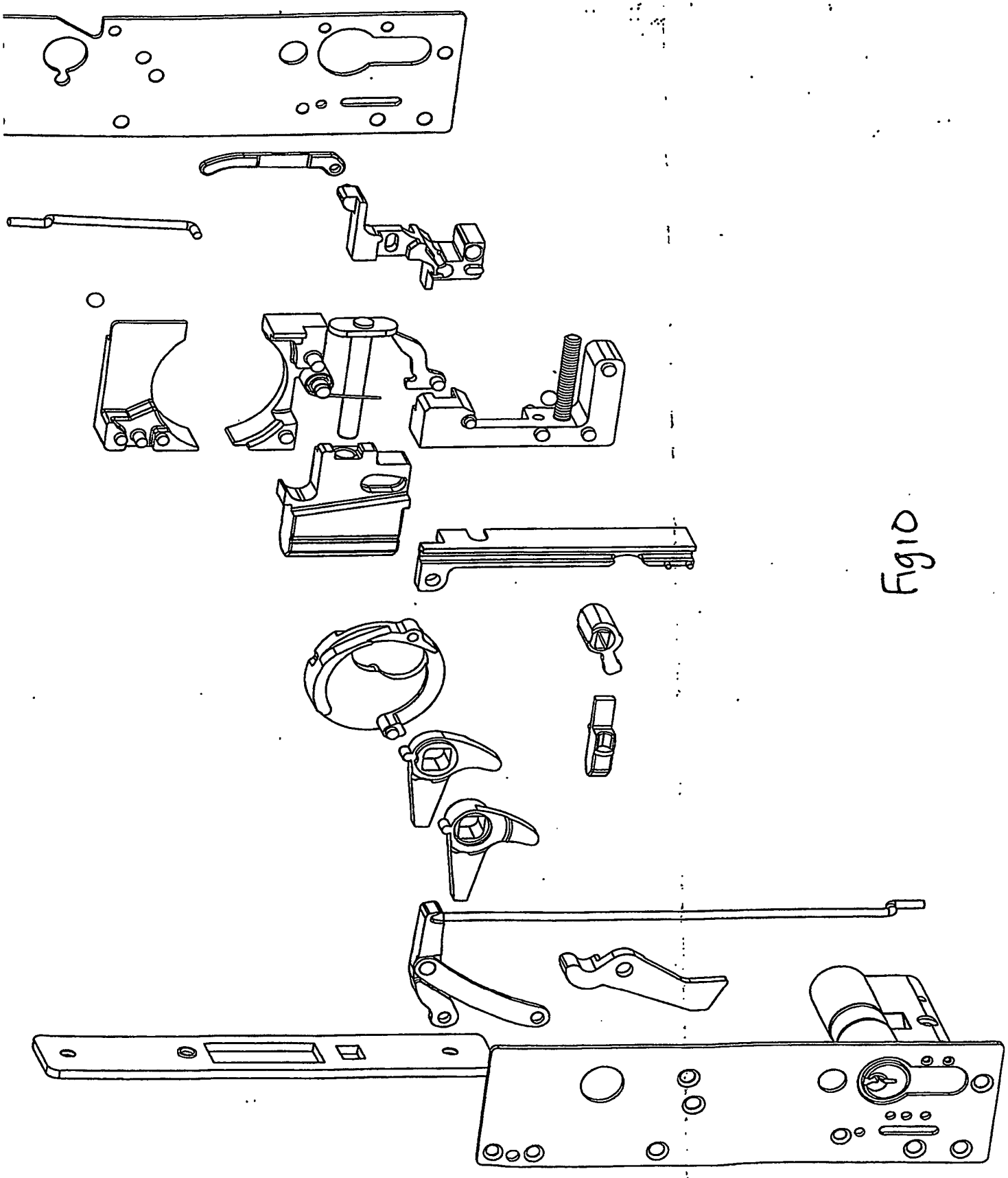


Fig 1D

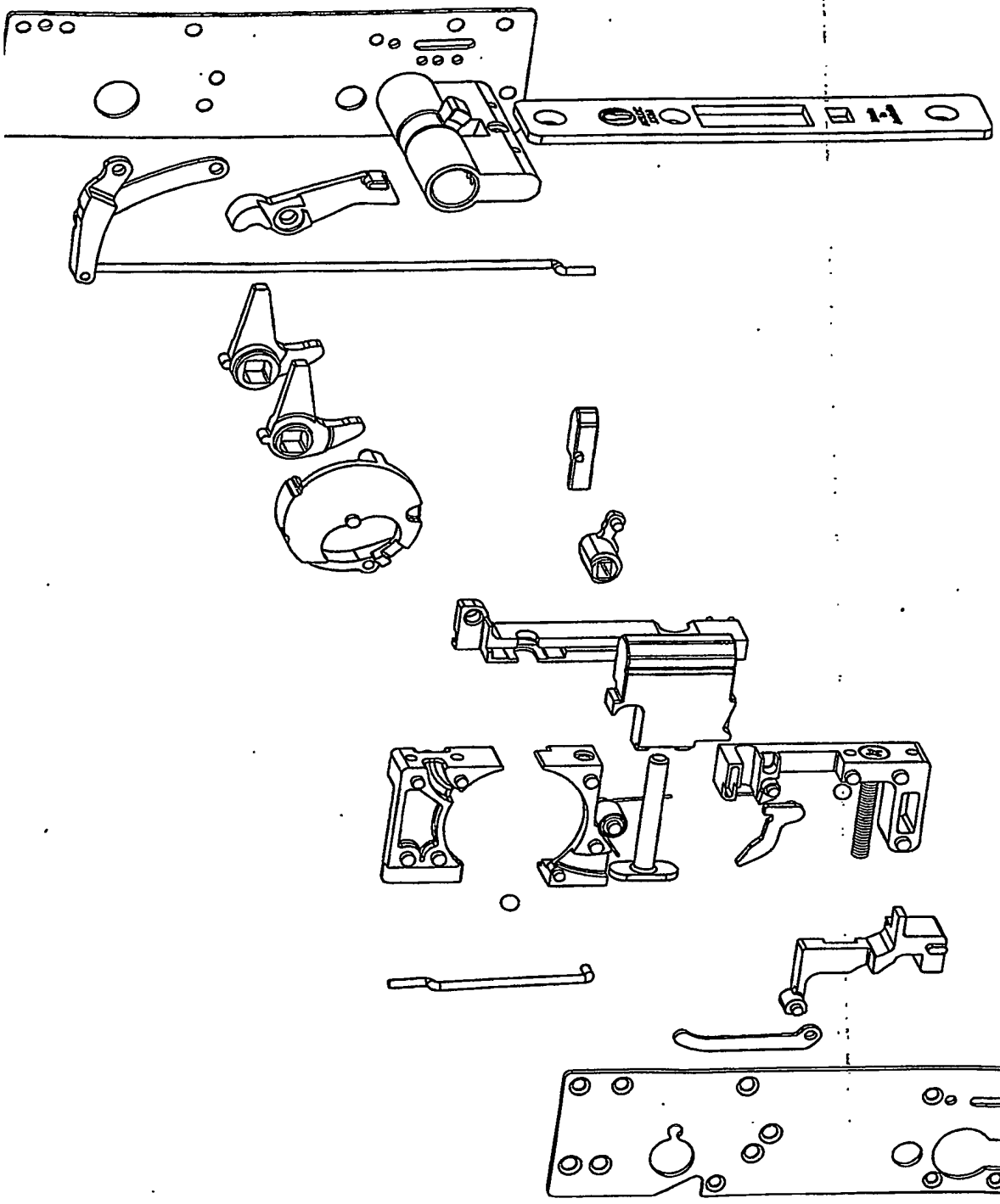


Fig 11

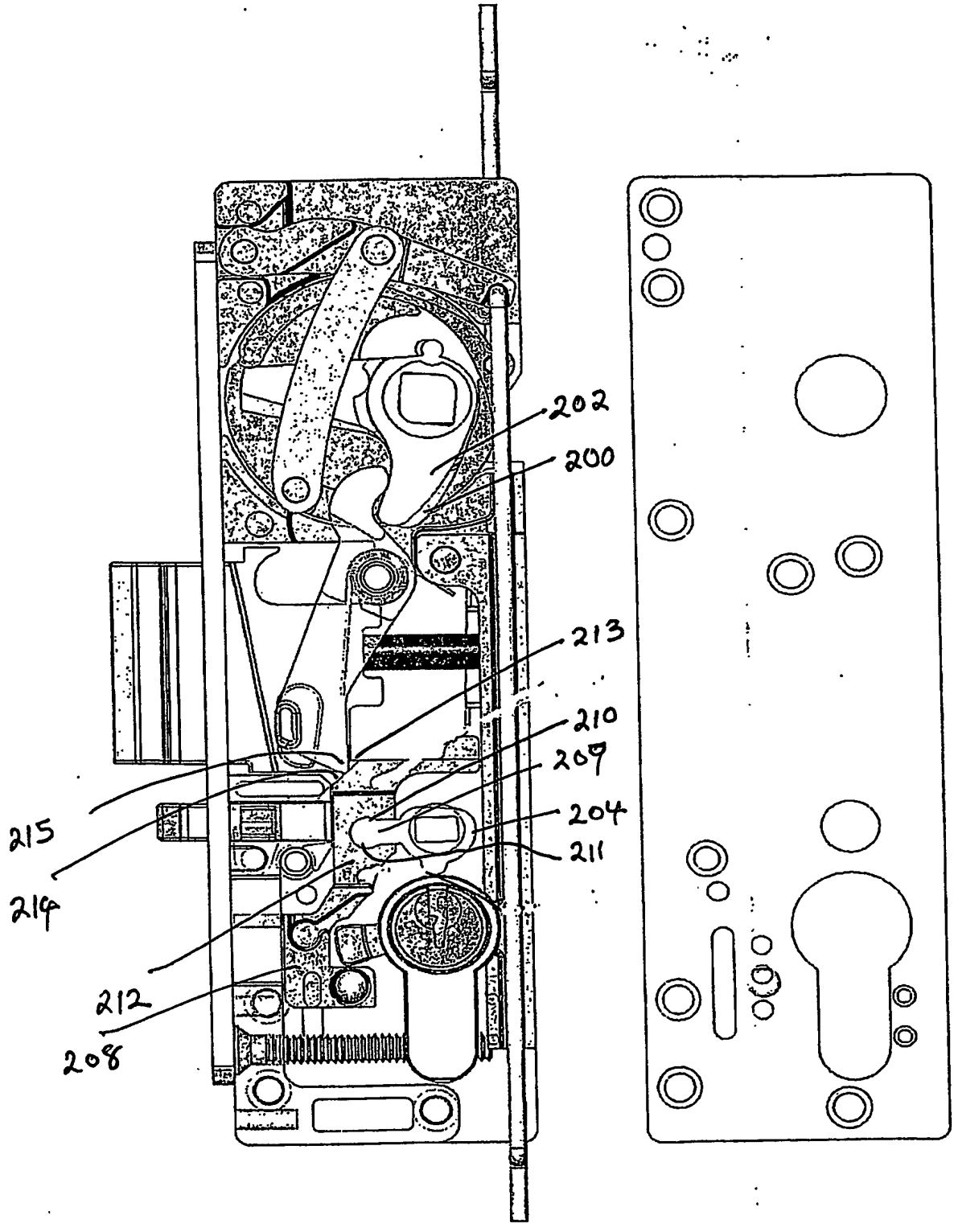
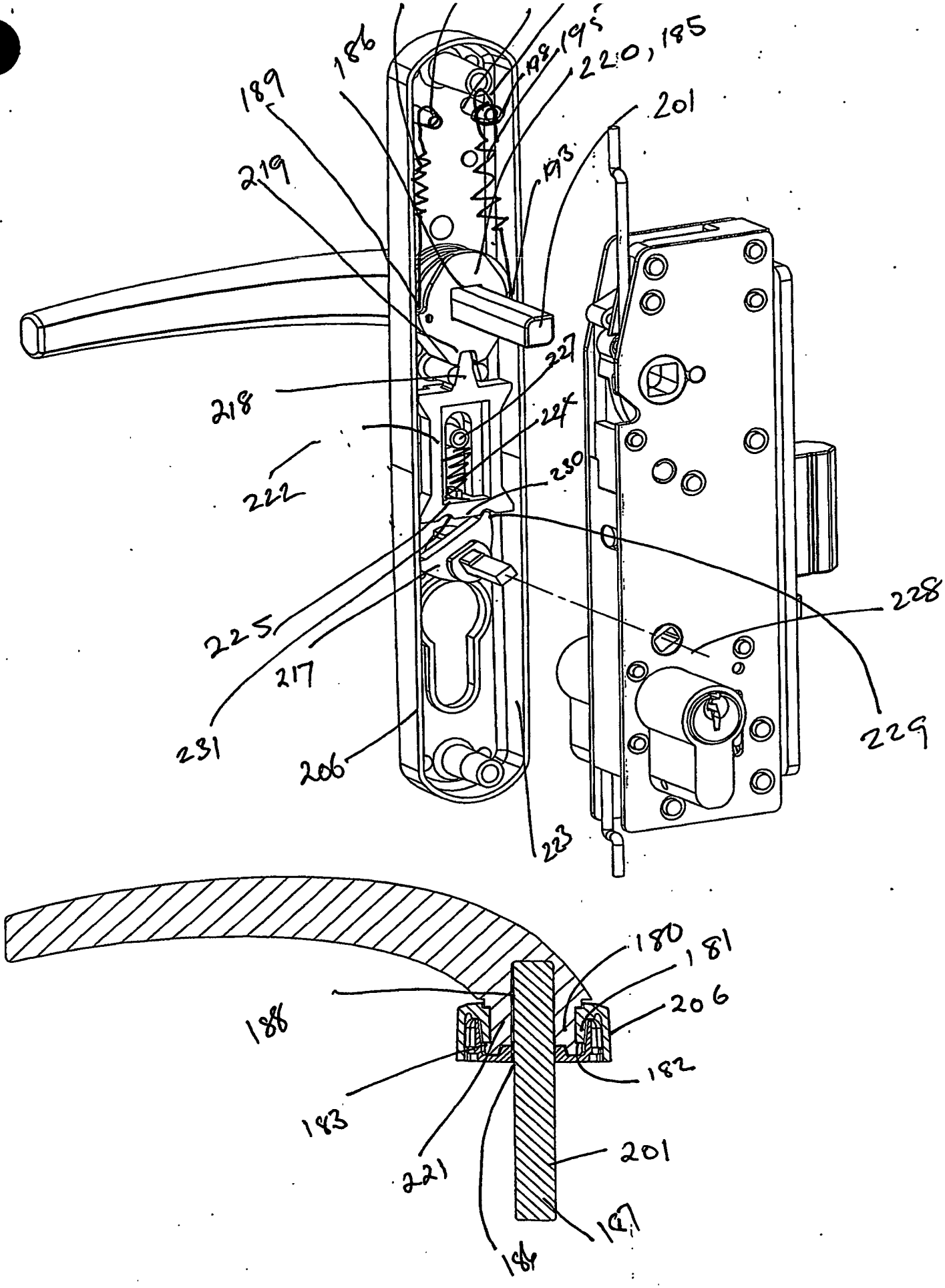


Fig 12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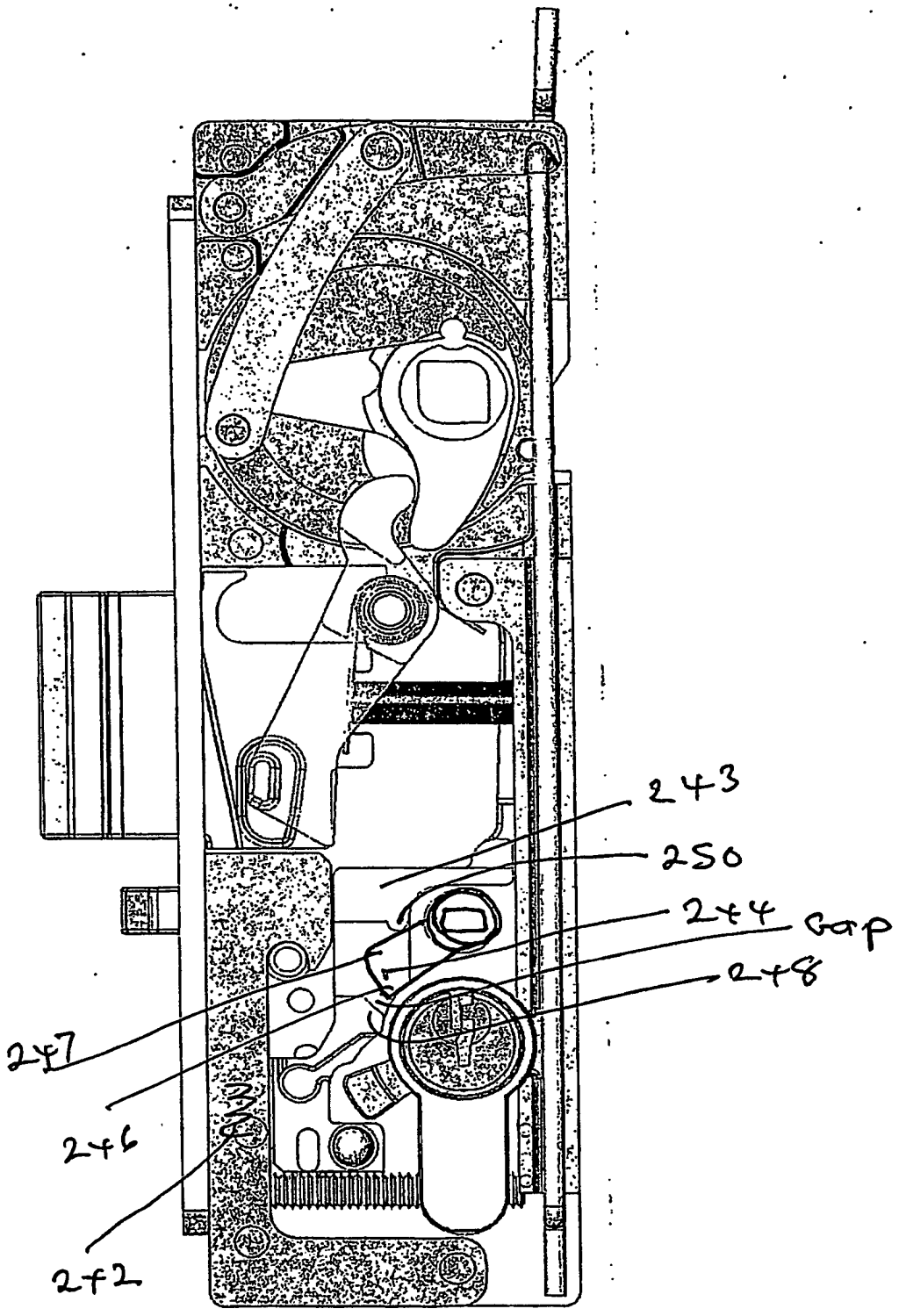


Fig 14

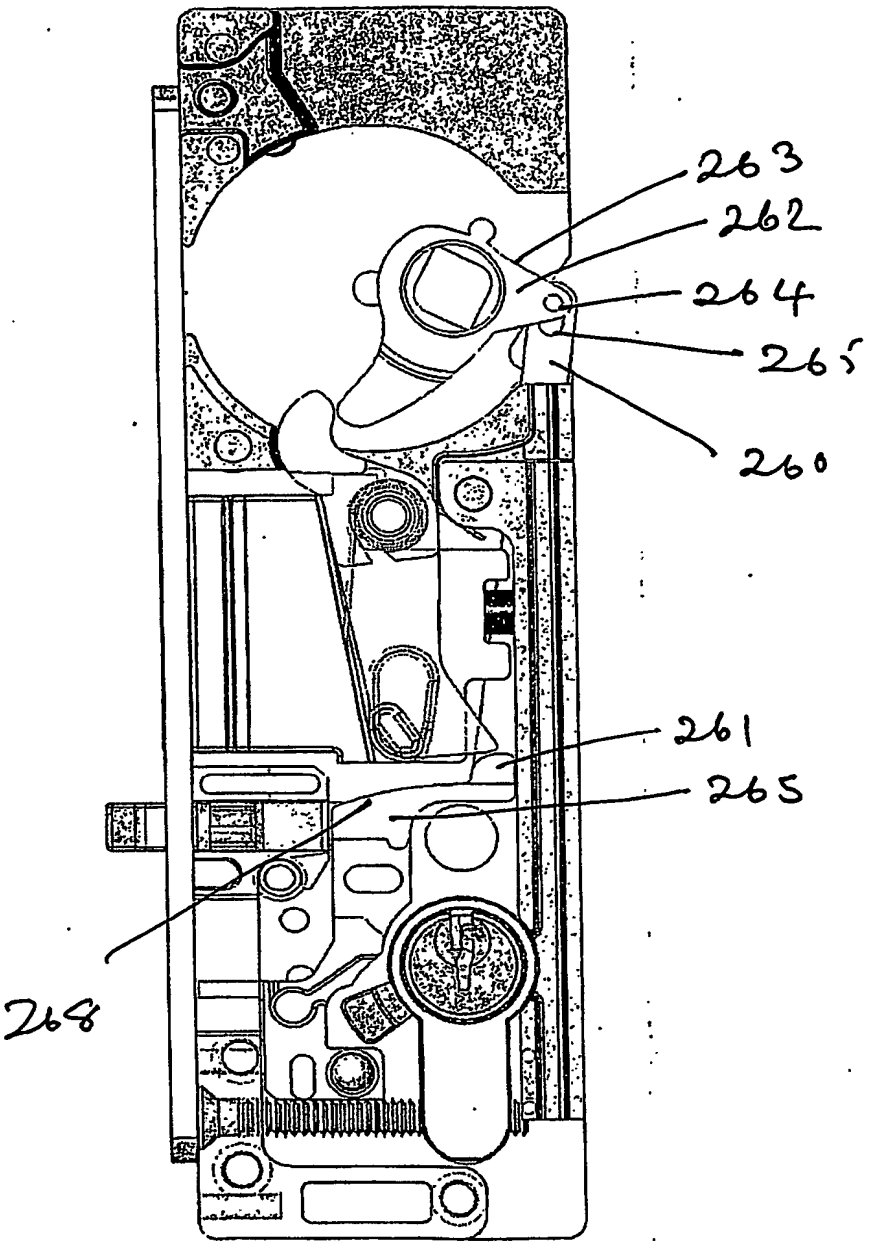


Fig 15

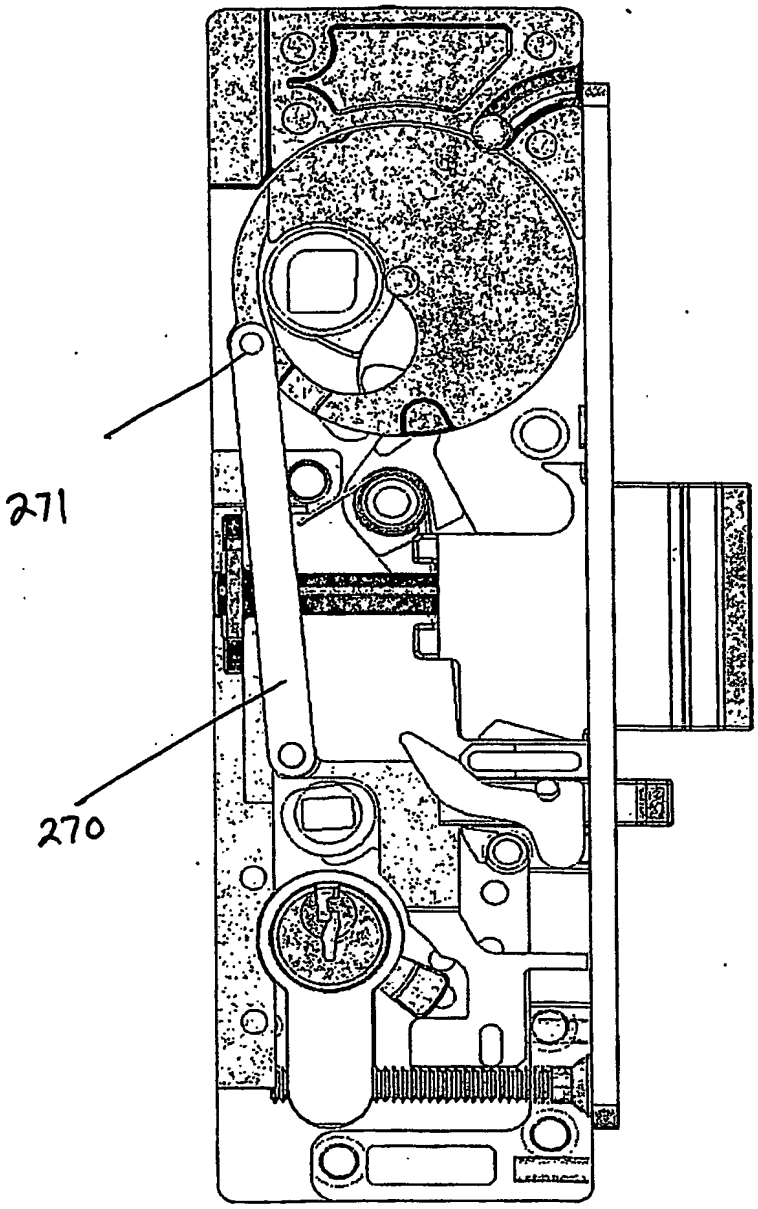


Fig 16

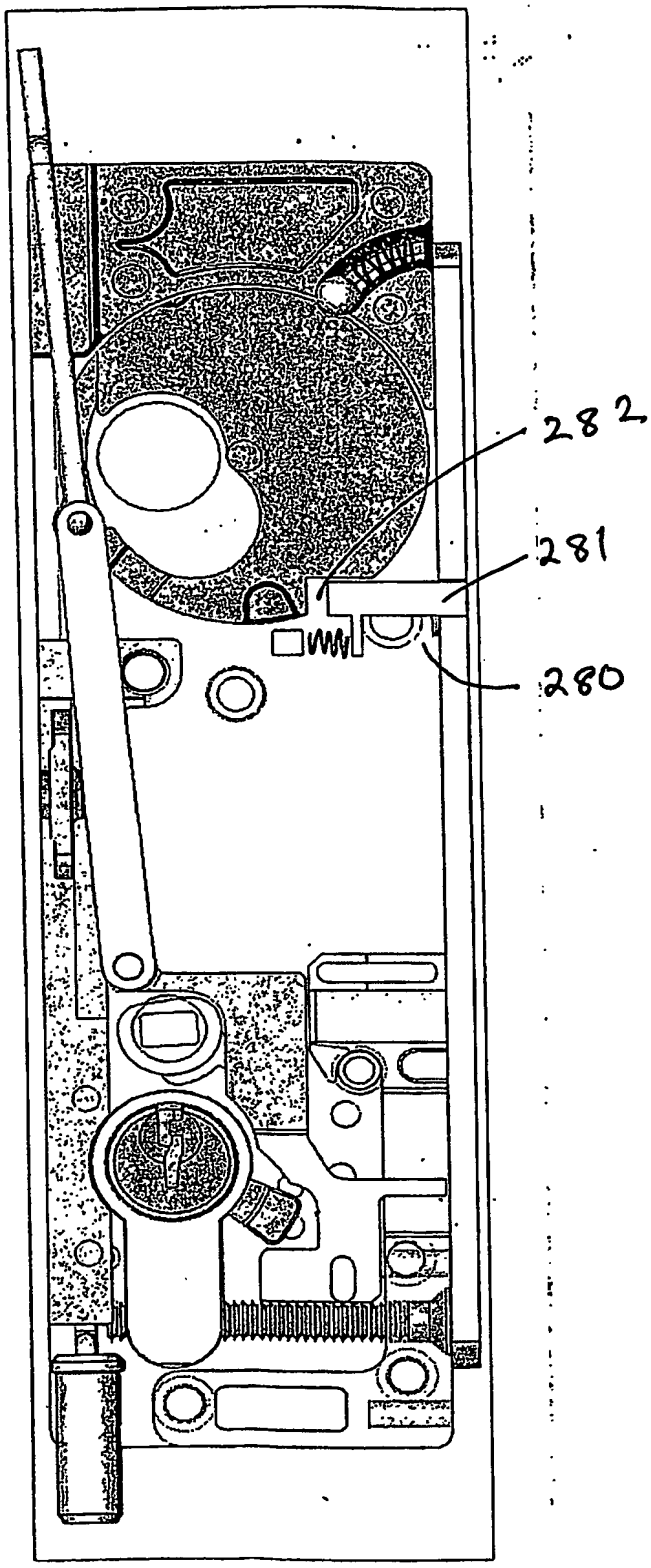


Fig17

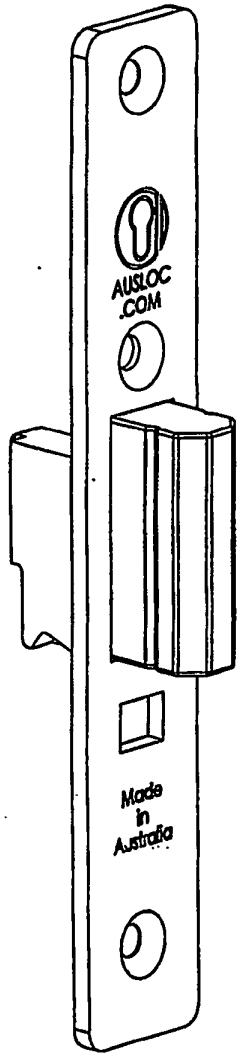


Fig 18

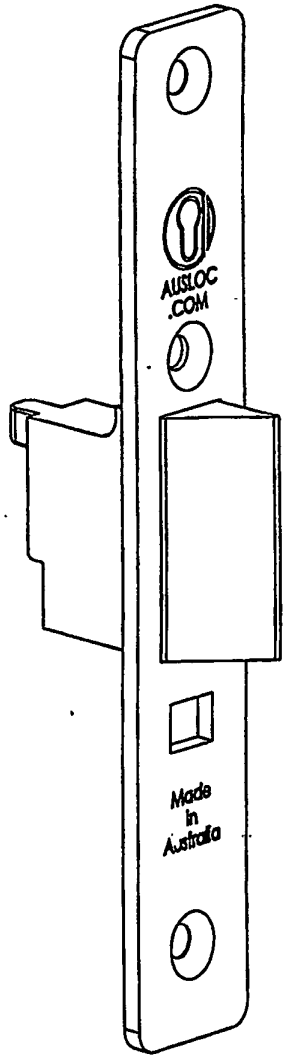


Fig 20

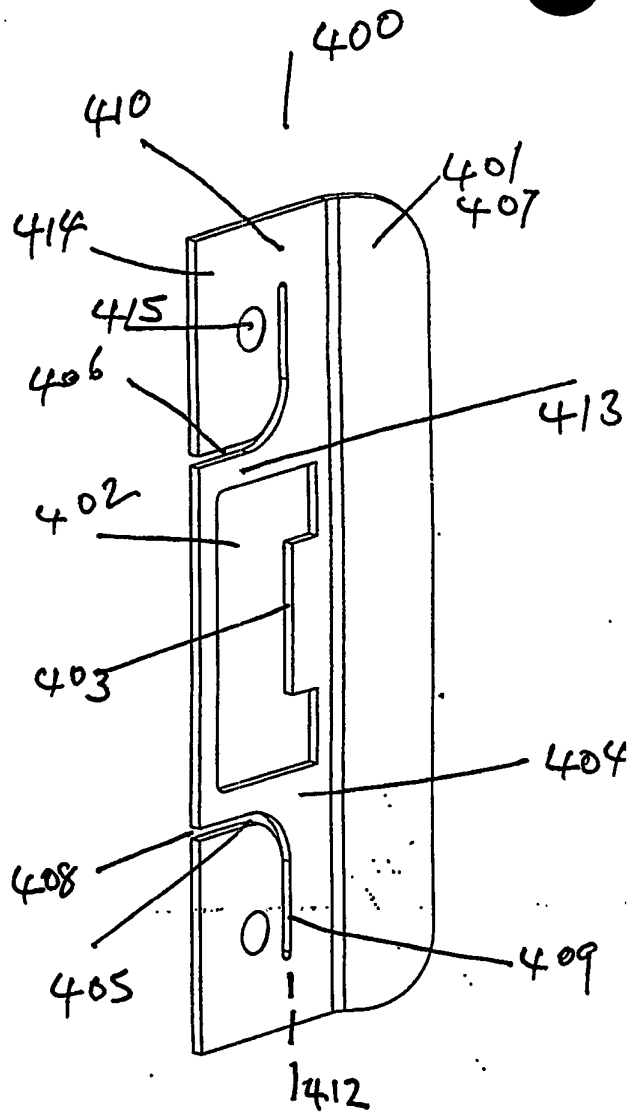


Fig 25

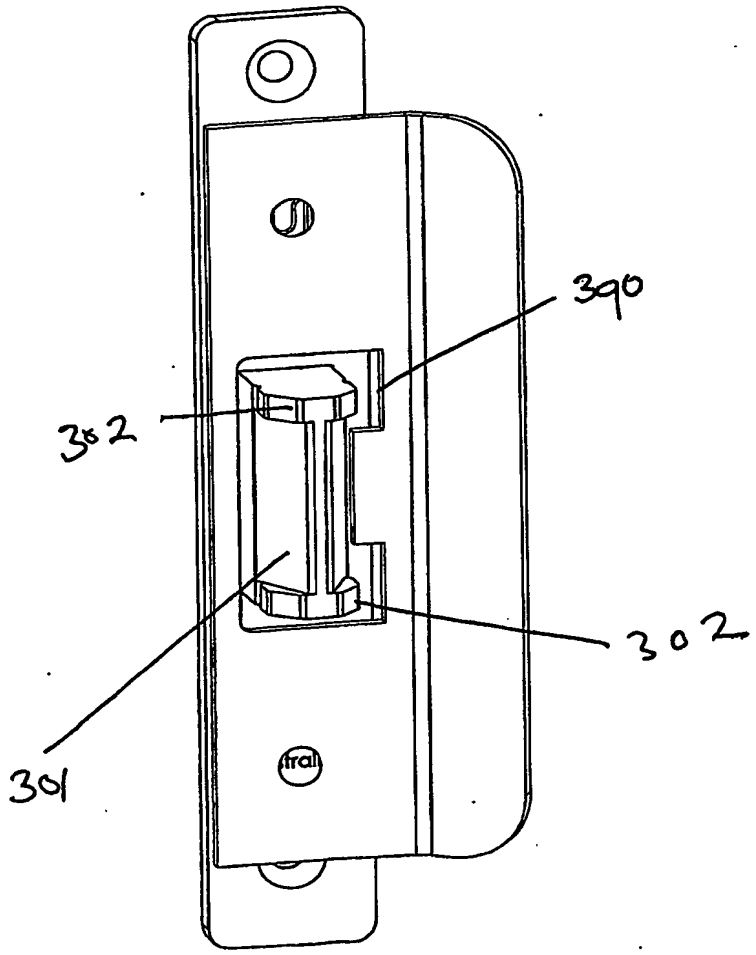


Fig 19

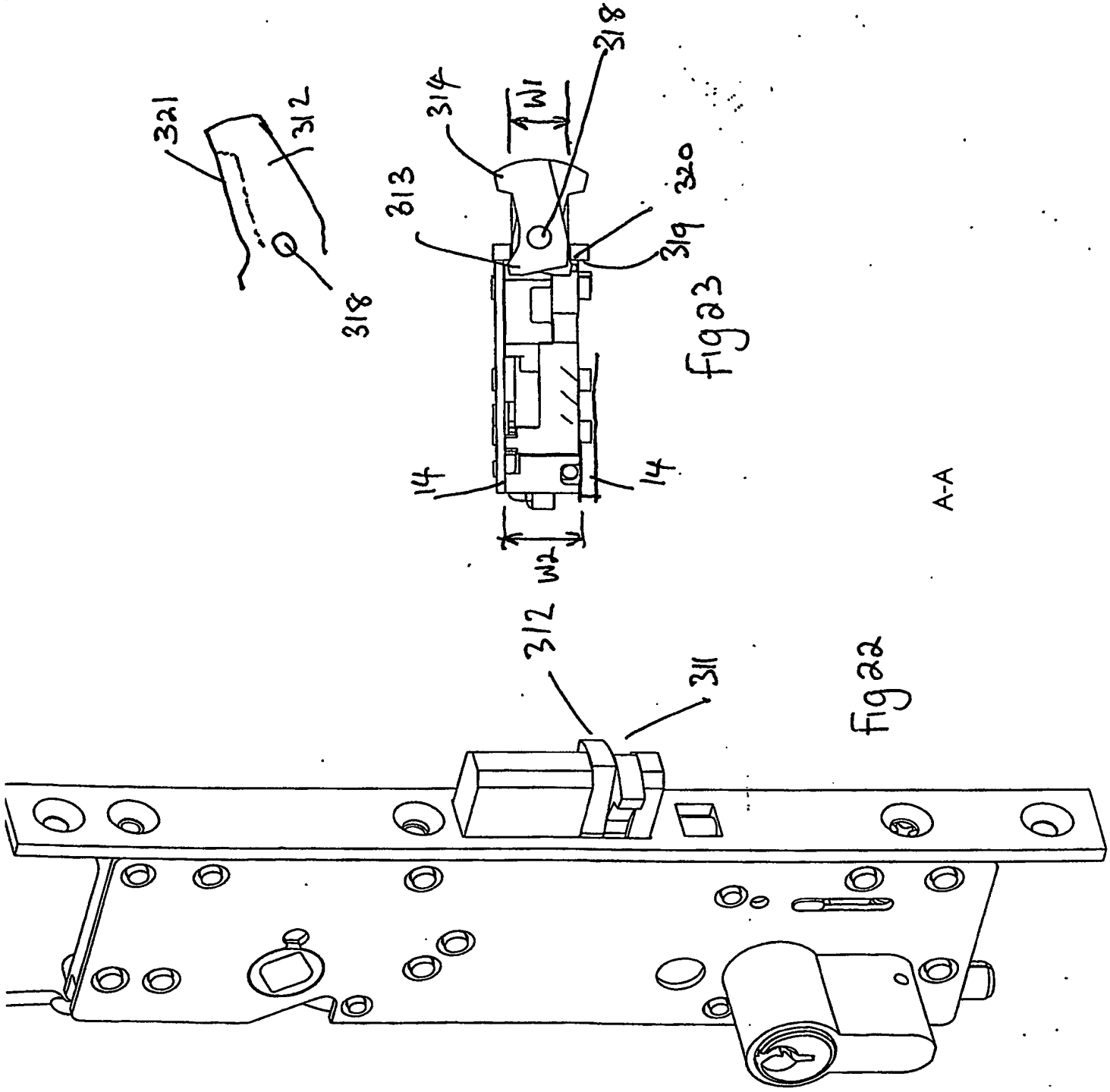


Fig 23

Fig 22

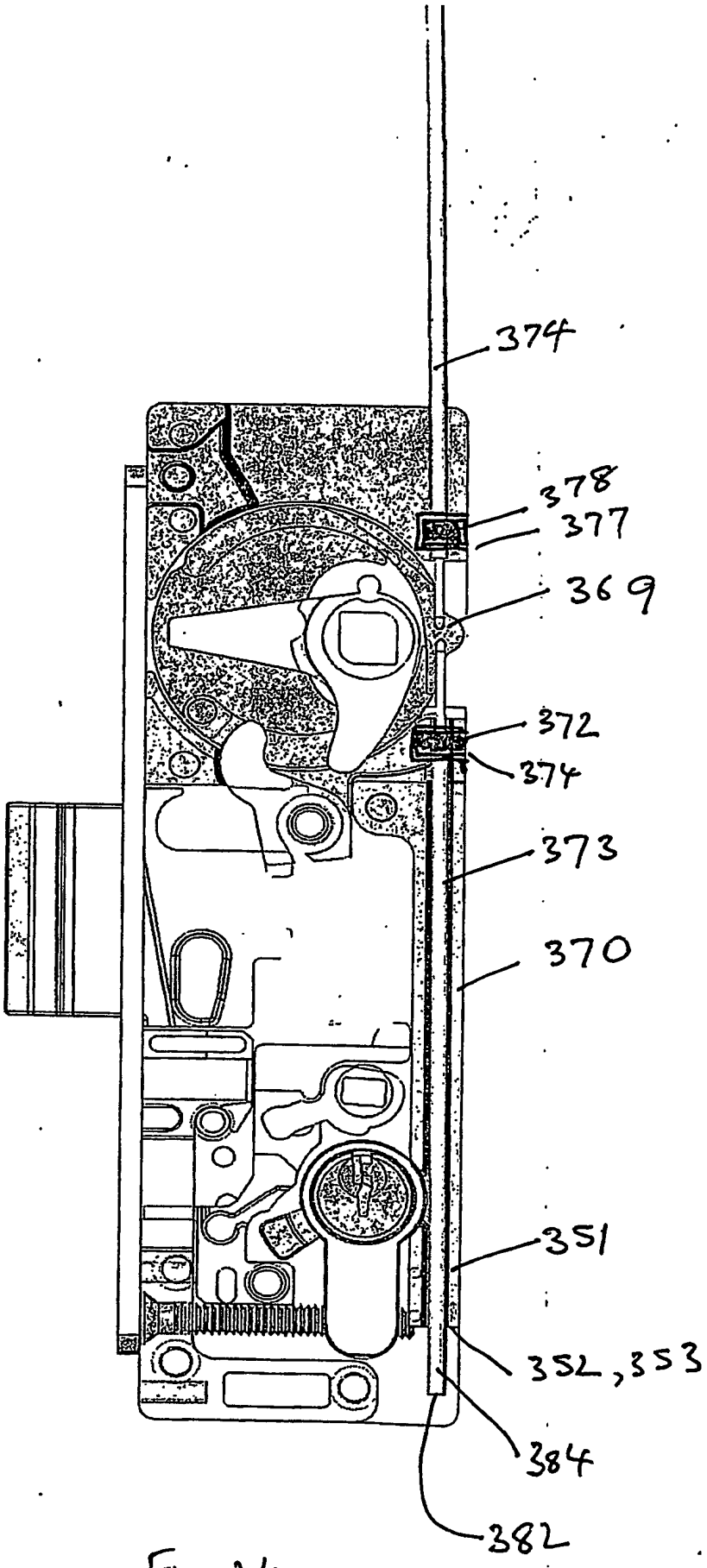
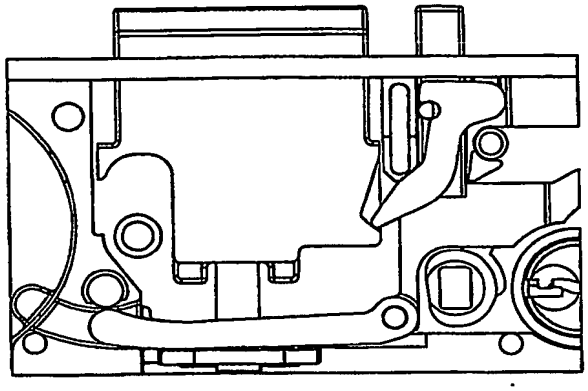


Fig 24



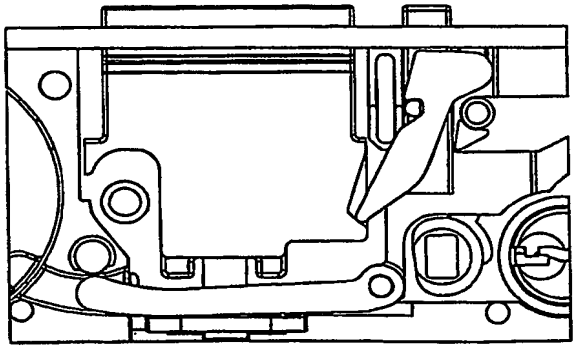


Fig 25